

THE PAPER INDUSTRY IN SCOTLAND
1700—1861

by
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PREFACE

The idea for this study arose from discussions in the Department of Economic History of the University of Edinburgh and in the Royal Scottish Museum. On the one hand, this industry, so important in the Scottish economy, had received surprisingly little attention; on the other, the subject is particularly relevant to the work of the department of technology.

In the early stages it seemed doubtful if there was enough material available for the study. Search and collection were carried on in the Scottish Record Office, at paper mills, in lawyers' attics and cellars, in libraries and from a widening circle of those interested, both in this country and abroad. It seemed that the total quantity was adequate. Selective enquiry continued. On labour unions and organisation a minimum was found and reliance has had to be placed on secondary material for this aspect of the subject. On the other hand, the long series of insurance policies (from a suggestion of Dr. A. H. Shorter) produced considerable material for use in discussion of the finance of the industry. This is a source which may well prove valuable in further studies.

The period chosen extends from just before the Union to the end of the Excise duties and the introduction to the industry of esparto grass as a new raw material. Evidence of Scottish practice has been sought throughout involving a good deal of technical description in the hand-made period.

The main emphasis, however, has been on economic development and growth through the hand-made into the machine era. As information for the introductory period was discovered, its importance proved to have been greater than was previously thought and this chapter was expanded to embrace the material and to set the scene for the rest of the study.

My thanks are due to Professor Youngson, who, by challenging comment in the early stages did much to spur on the search and also to Professor Saul and Dr. Smout for careful criticism and helpful guidance.

The paper used for this thesis was made at Valleyfield Mill, Penicuik.

Cowan Extra Strong 11 lb.

Cowan Extra Strong 18 lb.

List of Abbreviations

A. P. S.	Acts of the Parliaments of Scotland.
BOEC	Book of the Old Edinburgh Club.
Excise Library	Customs and Excise Library, London.
J. Econ. Hist.	Journal of Economic History.
Nat. Lib.	National Library of Scotland.
N. S. A.	New Statistical Account.
O & B and R W	Oliver & Boyd and Robert Weir.
OSA	Old Statistical Account.
OSP	Old Session Papers.
P. P.	Parliamentary Papers.
P. R. O.	Public Record Office.
RPCS	Record of the Privy Council of Scotland.
RSM	Royal Scottish Museum.
S. F. I. P.	Sun Fire Insurance Policy.
S. R. O.	Scottish Record Office.
T & C	Thornton and Collie.
W. P. T. R.	World's Paper Trade Review.

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CHAPTER ONE

Background and the development in Scotland before 1700

As far as can be determined the first paper mill in Scotland was set up at Dalry in 1590.¹ This was just on 100 years after the corresponding English establishment and some 300 years since the industry had become a going concern in Italy.

In order to see the infant industry in Scotland in perspective, a brief review of the European and English developments will be made. Then, following an outline of the Scottish economic and governmental background, the beginnings and early development of paper making in Scotland will be traced in greater detail.

Early Western European Paper making²

The earliest European paper making was in Spain, in a mill near Valencia. The craft was brought by Arabs before the year 1100, but does not seem to have developed to any great extent. In Portugal, though a start was made under King Joao I, no paper making industry developed before the eighteenth century.

The most influential country in the early years was Italy. Here, paper making was flourishing at Fabriano in the late thirteenth century.

1. See p.14 below.

2. For a fuller account of early paper making in Europe, see various articles in The Papermaker Vols. 24-32 on which this section is based. In particular, Henk Voorn, Vols. 24 pts.1 & 2, 25 pt.1, 28 pt.2, 29 pt.1, and 30 pt.2., Arnim Rinker Vols. 25 pt.2 and 30 pt.1. Peter Tschudin Vols. 27 pt.1, 31 pt.2 and 32 pts. 1 & 2. A.F. Gasparinetti Vols. 27 pt.1 and 29 pt.1.

In 1389 a famous statute of the city of Bologna laid down eleven articles for the paper making craft. These covered such things as the sizes of sheets, the weight, the price, regulations on watermarks, as well as on quality and quantities. In this last section, the ream was laid down as containing twenty quires and the quire as consisting of twenty five sheets. It is also interesting that the sizes of sheet were drawn out full-size on a marble tablet and included Imperial, Royal and Medium. The sizes of these, taken from the tablet, were very nearly the same as for those denominations of paper to-day. There seems little doubt that Italy's paper industry developed as it did because Italy was the centre not only of the church, but of the civilised world.

In France a very early start was made, a mill being established at Troyes in 1338. The Auvergne, where hand made paper is still produced, was, however, the cradle of the French paper industry. It was not the exclusive paper producing area but was the most important.

Germany, which supplied many of the early Scottish and English paper makers, had its first mill established by Ulman Stromer at Nurnberg in 1390. The invention of movable type in 1440 launched the printing industry and this did much to encourage and develop German paper making. Subsequently, of course, printing gave great impetus to paper making and the use of paper throughout the continent.

Another country early in the field of paper making was Switzerland and, though it is not known to have had any influence on Scottish paper

making, it may be recorded that the first three mills were established respectively in 1435, before 1450 and about 1455. By 1470 there were several Swiss paper mills in operation, a pattern of rapid development not found in the rest of Europe.

The history of paper making in Holland dates from 1428 when the first mill was started at Gennep. The next was not for over 150 years, in 1586 at Zwijndrecht near Dordrecht. One of the reasons for the long delay between first and second establishments was similar to that described in a diary written by Ulman Stromer of Nurnberg.¹ In this he details his efforts to secure a monopoly, by having his Italian and German workers swear secrecy and allegiance to him. Under the terms of English patents too, the setting up of other mills was forbidden. Thus in the very early days steps were taken to restrict rather than to expand and encourage the industry. However, with the start of mills at Zwijndrecht near Dordrecht in 1585, at Schiedam in 1595 and in Zaanland in 1601 the Dutch industry may be said to have made an industrial beginning. The Hollander beater, which replaced the stampers for rag preparation, is in use to this day. It was known before 1673 in Zaanland and about 100 years later it came to Britain.² Its enormous influence in reducing the time of rag preparation and increasing output makes the

1. Hunter D. Papermaking p.232.

2. Supplement to the Universal Magazine (London) Vol.X.June 1752 p.315 also Royal Society of Arts. Guard Books Vol.III, pp.43,50 quoted by Coleman British Paper Industry p.110.

early Dutch industry of great importance.

In Holland, one other item of rather later date, was the law of 1751, which prohibited the recruiting of Dutch craftsmen by foreigners. Heavy penalties, including death in certain cases, were to be imposed. This underlines the difficulties under which the industry developed due to shortage of skilled craftsmen and explains, at least in part, the slow emergence of the craft.

It is perhaps surprising that Scotland's paper makers did not have closer contact with those of Sweden. This may have been because the earliest installation there, which was by German paper makers in 1565, lasted for only about 10 years. The next mill was not started till 1612 when Gustavus II persuaded another German, Arnold Schlodt, to start one at Uppsala, and it was quite a small affair.

In Denmark, though Tycho Brahe set up a mill on the then Dutch Isle of Hven in 1589, no established industry developed for some time. Norway's tentative entrance into the paper making world did not take place till 1695. At Akerselva, now part of Oslo, a small mill was set up in that year by a group of Dutch paper makers. In the following hundred years, however, only two further mills were started. In the early hand-made era, before wood pulp had become an important, even a possible, paper making material, Norway was a "receiving" country in the craft.

Early beginnings in England

In England a start was made by John Tate at Hertford in about 1495. The project was short-lived, for he died in 1507 and, although one might

have expected his eldest son, Robert, to have inherited the mill, Tate left instructions that it was to be sold.¹ The familiar pattern of a long delay after the first essay in paper making, noted in several European countries, occurred also in England. In the 1550's a German technician was brought in to establish a mill at Fen Ditton near Cambridge. Another contemporary mill was reported at Bemerton near Salisbury. Then some time between 1575 and 1580 Hans Spilman of Lindau,² who had been living in Nurnberg, came with his wife, Elizabeth Mengel, to England. He became jeweller to the Queen (and later to King James) and possibly as early as 1585 set up a paper mill on his estate near Dartford. This mill continued in the Spilman family till the death of his son John in 1641. Hans was knighted by King James in 1605 - though it may be that his gold had helped the king more than his paper. The mill, however, and the man can be said to have been the first to succeed economically. There was, it is true, trouble over the rigorous wording of his patent, but this serves also to show the existence of other paper makers in the country at that time. That such others were becoming established, and in increasing numbers, is shown by Shorter who has traced thirty seven mills between 1588 and 1650.³

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1. See also Hunter D. Papermaking p.115 (footnote) and Coleman D.C. The British Paper Industry, p.40.
 2. See Sporhan-Krempel "Hans Spilman from Lindau" The Paper Maker Vol.32, No.2.
 3. Shorter A.H. Historical Geography p.27 quoted by Coleman in the British Paper Industry, p.49.

Though it is a little beyond 1700, an Excise Treasury letter of 10th September 1712 gave the number of paper makers in England, Wales and Berwick-on-Tweed as 209.¹ This figure can not be taken to be the same as the number of mills² but with the figure 7 for Scotland the wide disparity between the paper making industries of the two countries is manifest. The letter also contained figures for three other industries. They were, for England and Wales:- Soap makers, 1107, Callicoe printers, 554, and Starch makers, 272. The corresponding figures for Scotland were 9, 16 and 13. Such wide differences underline the relative and economic disparities between the two kingdoms as already outlined above.

It would seem then that the English paper industry was well established by the end of the sixteenth century. After 100 years of existence it was producing nearly half of the home requirements³ so that clearly it was a strong and, for the period, well developed industry.

Reviewing then the early paper industry in Europe it seems that Italy was the first country to be well organised, both for production and export of paper. France, Germany and Holland as "source countries" had

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1. Excise Library. Excise-Treasury letters 1693/4-1721/2 f.62
 2. In the O.S.A. for Galston (Vol.II p.82) the number of paper makers is given as 3 but there was only one paper mill. Also for Cathcart (Vol.V p.344) the number of paper makers is given as 5. From the text it seems that of the two mills in the parish only one was then (1793) in operation. In view of the practice of Vatman and Coucher frequently interchanging their particular jobs, both may have been reckoned as "paper makers" - if not also the Layer.
 3. Case of the Paper Traders, quoted by Coleman p.58 footnote. (The British Paper Industry).

perhaps the greatest influence on Western European paper making. France, apart from considerable exports, provided a number of technical and economic pioneers. In England Henri de Portal, in Scotland Nicolas de Champ and in both, Nicolas Dupin may be instanced. From Germany came Spilman and a workman of his, Hans Buchschor, both buried at Dartford. Scotland's earliest paper craftsmen were also German as was Peter Bruce, the engineer who figured so prominently in Scottish paper making before 1700. From Holland came a machine, the incomparable Hollander, key to the whole increasing output of the industry in the eighteenth and early nineteenth centuries. As time went on England was also able to be a "source nation" and contributed both men and materials to Scottish paper making. In her turn too Scotland became a source both for the New World and the old. In Scotland, as in England, is seen the familiar European pattern of a start far earlier than the follow-up and development. It is probable that the cause in each case was not primarily the dying out of the craftsmen nor the highly restrictive action of the original patent. The main reasons were a low level of social and economic development and a chronic shortage of linen rags - especially where wool was the staple.

Economic and governmental factors in Scotland in seventeenth century.

As has been already stated, the first known paper mill in Scotland was started in 1590, just on 100 years after the corresponding English establishment. This fact reflects in a measure the difference in economic development between the two kingdoms before the beginning of

the eighteenth century. The very success of England served to emphasise Scotland's backwardness and shortcomings. In Scotland it was felt that in some way the economic success of the southern kingdom was achieved at Scotland's expense, or at least that England was in some way responsible for Scotland's backwardness. This failure, or immaturity of development, was quite general: even the North Sea fisheries were exploited almost exclusively by the Dutch, within sight of the Scottish coast.

In the period concerned, new manufactures were generally established by the granting of Royal Letters Patent. Nominally granted to encourage a particular manufacture, they were often enough primarily a reward to a Royal favourite, or a means of raising funds for the Royal purse. One example of the former type of privilege, quoted by Scott,¹ was that granted to Nathaniel Uddart in 1619 for a soap manufactory at Leith. It should not be thought that all patents were of this type, and the abuse was not as serious in Scotland as in England.

The Scottish Parliament, especially following the Union of the Crowns, sought to give positive encouragement to industry, and even more, to the establishment of new industries in Scotland. Most luxuries and manufactured goods were imported from Europe or England. One common factor, therefore, in the encouragement of any local manufactures was the granting of facilities, and indeed of inducements, to foreign nationals to

1. Scott W.R. Joint Stock Companies to 1720 Vol. III, p.124.

settle in Scotland. Such men were needed for two separate yet cognate reasons: firstly to perform the actual manufacturing and secondly to instruct Scottish workmen in the particular craft. Thus, though slightly earlier, seven Flemish weavers were induced, in 1601, to settle at Bonnington (near Edinburgh) and this pattern continued until well into the eighteenth century. Two examples of workmen producing and instructing, which will be dealt with below, concern Nicolas de Champ and Nicolas Dupin. The first of these worked at Dalry and trained James Lithgow and then set up his own mill. The second specifically agreed to train ten apprentices, two for each of five necessary paper making skills for his Company's two mills.¹

In 1623, in England, the Statute of Monopolies was passed.² This was specifically to prevent the granting of monopoly privileges to royal favourites, though one clause allowed that it should continue to be lawful for the Crown to grant letters patent for limited periods for "the sole working or making of any manner of new manufactures within this Realm to the true and first inventors of such manufactures".³ A second exception related to printing (which had its direct and indirect influences on paper manufactures) and a third to the making of gunpowder.

The feeling of revulsion in England at the rewarding of Royal Favourites, was to a considerable extent shared in the northern kingdom.

1. S.R.O. Register of Deeds Durie Office 4 Apr. 1698 quoted by Waterston B.O.E.C. Vol. XXV, p. 62.

2. 21 James I c. 3.

3. Stair Society Vol. XVII, p. 59 and Sec. 6 21 James I c. 3.

This resulted in the Statute of 1641¹ which declared "that all patents for monopolies, purchased or to be purchased for the benefit of particular persons, in prejudice of the public, are to cease in time coming". A feature of both these Acts, unlike subsequent United States practice, was that previous foreign manufacture or patent was no bar to patent granting in the home country (i.e. in England or Scotland). This led to a celebrated case concerning the paper industry in the early 19th century, which was the more surprising as under Article 6 of the Union of 1707 the Statute of Monopolies (21 Jas.I C.3) was made applicable to Scotland.

In 1641 also, an Act² was passed by the Scottish Parliament to encourage the production of fine cloth. In 1645 an exemption from military service and billeting was granted³ to those engaged in this trade. Following this, factories were established at Ayr, Bonnington and Newmills (East Lothian).

Lack of adequate capital, and operation in a poor country with a debased coinage, were difficulties with which the paper and other infant industries had to contend. It may well be that under - capitalisation was a major contributory cause of the frequent industrial failures which occurred in the 18th and early 19th centuries. In any case, considerable real financial inducements were needed to entice the

1. A.P.S. Vol.V, p.411.

2. Ibid p.497.

3. Ibid Vol.VI, p.174.

foreign technical workers. The local merchants stood to lose financially and they sometimes hindered the smooth development of new home industries. This hindrance was often caused by the illegal importing of goods, whose entry was prohibited, for the protection of the new manufactures. The merchants themselves were often men of substance and importance in local politics, so that the Convention of Burghs was less than co-operative in the matter of internal trade, which cut across their ancient monopolies or privileges.¹

In 1661 two Acts were passed,² aimed at overcoming the twin difficulties of attracting foreign workmen and of providing sufficient capital. For the first purpose naturalisation was offered, in addition to the original privileges. For the second purpose, a nineteen year exemption from public and local taxes was granted and the specific authorisation of the formation of joint-stock companies, with powers to incorporate themselves, was given. This contrasts with English practice of the period. It was under these Acts that Alexander Daes and his partners started a paper mill at Dalry and brought in foreign workers in 1674.³

In 1681 the importation and wearing of certain foreign-manufactured goods were prohibited by the Privy Council.⁴ These prohibitions were

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1. T.C. Smout, Scottish^{Overseas} Trade on the eve of Union, pp.15-17.
 2. A.P.S. Vol.VII, pp.255-261.
 3. R.P.C.S. Ser.III, Vol.VI, p.142.
 4. S.R.O. Acts of the Privy Council.

incorporated into an Act for encouraging trade and manufactures.¹ This consolidated what had gone before, specifically naming the manufactures of cloth, linen, stockings and soap and the teaching of the respective skills to Scotsmen. In the same year a patent was granted to Peter Bruce for the manufacture and sale of playing cards and this covered the manufacture of the paper for the cards.²

As a result of these Acts, several companies were started, as follows:- Wool Cards (Leith) 1663, Glass (Leith) 1664, Sugar (Glasgow) 1667, Whalefishing and Soap 1667, Sugar (Glasgow) 1669, Fishing 1670, and following the 1681 Act came a Pin work (Leith) 1683, a Foundry (Edinburgh) 1686, Ropes 1690, Gunpowder 1690, Draining Engine 1693, the Scots Linen Manufacture 1693, Baizes 1693, for Working Mines and minerals in Scotland 1694, Company for making white paper 1694, Sail-cloth 1694, Saw-Mills (Leith) 1695, Gunpowder 1695, Silk 1697, Hardware (Glasgow) 1699 and 1700, Stockings 1700, Cardage 1700 and Pottery (Glasgow) 1703.³

In all this government sponsored industrial activity it may be felt that paper was not very greatly represented nor of any great importance. However, though there are examples of two or more manufactories of the same materials or products in the list, the quantity of paper used in the latter half of the 17th century in Scotland was small. Also the list does not contain co-partneries and as will be seen below several small paper

1. A.P.S. Vol.VIII, p.348.

2. R.P.C.S. Ser.III, Vol.VII, p.288

3. Scott, W.R. Joint Stock Companies to 1720 Vol.III, pp.128 and 9, and for a fuller account of enterprises in Scotland, see pp.130-195.

enterprises were started in the seventeenth century. These were too small to be called an industry; south of the border things were further advanced.

The position in Scotland then was one of strong government desire to encourage the establishment of industries, yet of inability to produce goods of exportable quality. This is hardly surprising as most of the founding craftsmen had to come from abroad. It is open to question if those who came were the finest of the foreign craftsmen and the first generation of Scottish craftsmen could hardly acquire a high degree of expertise.

"overnight". Quite strong economic protection was given to the infant industries to enable them to survive on the home market¹ but there were many instances of illegal importation.² Moreover for some goods, and perhaps especially for paper, the market was small so that adequate experience of consistently high output and output of high quality was lacking. Many people were living at subsistence level and an economy must support its own industries; they can only with difficulty be grafted on by Government action. A healthy export trade usually grows from a healthy home market and this, Scotland did not have in the seventeenth century.

Development of paper mills in Scotland before 1700.

In this unpromising economic climate there were at least twelve

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1. In addition to his patent for playing cards, Peter Bruce (and James Home) obtained an embargo on the import of all blue, grey, and pressing papers and pasteboard in Dec. 1686. R.P.C.S. Ser. III, Vol. XIII p.41
 2. Ibid p.39 and Vol. VII, p.475.

attempts at paper mill establishment before 1700. It is not surprising that many of these were short-lived but perhaps it is surprising that so many were started and that some survived for so long. Though it is certain that they did not all continue till the year 1700, it is known that in 1697 a monopoly applied for by the Scots White Paper Company was refused by the Privy Council¹ "... in view of the existence of other paper mills."

The mills are listed in Table 1.

The earliest known establishment was in existence at Dalry by at least 1590². It was owned by Mungo Russell in partnership with his son Gideon.³ As the first paper mill is naturally of considerable historic interest the references will be given in some detail.

The first is a liberty⁴ granted to Peter Groot Haere and sundry unnamed persons with him "... to set up this art of making paper of all sorts within this realm". This was late 1589 or early 1590, when King James was away in Denmark on the occasion of his marriage to the Danish Princess Anne. This liberty was for nine years from the 1st August and according to Chambers was not taken up.⁵ However, on 5th December, 1590,

1. S.R.O. Acts of Privy Council under 15 July, 1697.

2. Waterston B.O.E.C. Vol.XXV, p.70.

3. S.R.O. Books of Council & Session Vol.50, p.342.

4. R.P.C.S. Ser.I, Vol.IV, p.452.

5. Chambers, Domestic Annals of Scotland, Vol.I, p.195 & Vol.2, p.398.

PAPER MILLS STARTED BEFORE 1700

<u>Mill</u>	<u>Where situated</u>	<u>Maker</u>	<u>Dates</u>
1. Dalry No. 1	Dalry, Edinburgh	Mungo & Gideon Russell	1590-1605?
2. Canonmills No. 1	Edinburgh	John Paterson (till 1681) Peter Bruce	1652-1683? This may have reverted to Paterson when Bruce left.
3. Dalry No. 2	Edinburgh	Alex. Daes (Died 1684) Arch. James & William Home and two others	1674-1699
4. Upper Spylaw	Colinton nr. Edinburgh	James Lithgow	1681-1707?
5. Canonmills No. 2	Edinburgh	Peter Bruce	1682-1683
6. Woodside	Glasgow	Peter Bruce	1683-1686
7. Restalrig	Edinburgh	Peter Bruce) James Home) (till 1690) James Hamilton	1686-1693?
8. Cathcart	Glasgow	Nicolas de Champ	1686?-1860?
9. Ayton	Berwickshire	William Hume	1693?-1700?
10. Braid	Edinburgh	Nicolas Dupin	1695-1714
11. Yester	Gifford Hall, East Lothian	Nicolas Dupin (till 1702)	1695-1774
12. Gordons Mill	Aberdeen	Patrick Sandilands	1696-1700?

Note The dates of the closures of most of
the mills are uncertain.

the Register of the Privy Seal states that a monopoly was granted to "Pietter Gryther (Peter Groot Haere) and Michael Keysar, Almanis, paper makeris" appointing them paper makers to the King for nineteen years.¹ Next there is the inventory of the effects of Mungo Russell who died on 8th September, 1591.² In this is an item "... owing by Michael Keysar, paper maker, £81.-.10d. Scots" (£6.15.1d.). On 24th February, 1595, "Michael Keysar and John Seillar, Almanis, paper makers registered "a contract made at Edinburgh on 3rd May, 1594"³ between themselves and Gideon Russell of Dalry Mills". In the course of this occurs the clause "... during the tyme of the said umquhile Mungo Gideon and Michael wer partneris of the work of the said paper making" showing that before his death in 1591 Mungo was established as a paper maker. Then on 14th May, 1605, Sir George Touris of Garmeltoun was served heir to his father John Touris of Inverleith in certain properties⁴ "... cum molendinis granorum et molendino paperio de Dalry...." (with the grain mills and a paper mill at Dalry).

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1. S.R.O. Register of Privy Seal quoted by Waterston B.O.E.C. Vol.XXV, p.53.
 2. S.R.O. Edinburgh Commissary 24 July, 1593.
 3. S.R.O. Books of Council and Session Register of Deeds Vol.50, p.342.
 4. S.R.O. Abbreviate of Retours Edinburgh No.152.

The suggested sequence of events, originally put forward by Waterston,¹ is that Mungo Russell, his son Gideon together with Michael Keysar, converted one of the Dalry Mills to paper making in 1590. What happened to Peter Groot Haere after the original conversion of the mill is not clear, but as a German, he fits into the plan of encouraging immigration of foreign workmen to establish trades or manufactories in Scotland. Then, after Mungo's death (in 1591), Gideon and his wife, Margaret Stewart, leased the mill for 11 years, in May 1594, to Michael Keysar and John Seillar (another German). The mill seems still to have been in existence after the 11 years according to the Touris document. It would seem then, that the first paper mill was established in Scotland in 1590, almost 100 years after the first in England. It lasted about 15 years while its English counterpart survived for some 12 years.

In England, after Yates' mill at Hertford, there was a gap of 50 years till the Fen Ditton mill was started. This was followed by several mills in fairly quick succession. The pattern of development in Scotland shows a close parallel, though following 100 years later. After the original Dalry project a period of at least 47 years elapsed before the second paper mill was started, probably in 1652.² It was at Canonmills,

1. Waterston, B.O.E.C. Vol.XXVII, p.57.

2. R.P.C.S. Ser.III, Vol.VII, p.502, 4th Aug.1682. In the course of this case, H.M. Advocate and Peter Bruce deponed that "... the said (paper) milne ... hath been a standing going milne thirty years agoe and upwards ..."

also on the Water of Leith. According to an Edinburgh Council minute, John Paterson was the operator and tacksman in 1659: a visit was to be paid to the mill by the Dean of Guild and others and they were to report to the Council.¹ Twenty two years later, on 1st October, 1681, Peter Bruce (Breusch) a German Engineer, took a lease of the mill from Paterson.² Four days later, on 5th October, he signed an agreement with an Edinburgh stationer named William Paterson under which he was to run the mill for Bruce for £250 (Scots) per annum.³ The project lasted for three years. In 1681 also Bruce obtained a patent for making and selling playing cards.⁴ Bruce was a man of outstanding gifts and diverse abilities. His short career in Scotland may be briefly outlined to illustrate both the kind of difficulties able foreigners found themselves faced with when they accepted the government's invitation to bring their skills to Scotland, and also the type of achievement that was associated with their names. Bruce came from Flanders and is usually described in legal papers as 'Engineer, German'. It is not known when he first came to this country, but the continued use of the term "German" suggests that he did not avail himself of - or perhaps did not qualify for - naturalisation under the Act of 1661.⁵

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1. The Dean of Guild is to this day the officer of the town council responsible for authority to extend buildings, etc. Minutes of Edinburgh Town Council, 6th July, 1659.
 2. S.R.O. Register of deeds, Mackenzie Office, Vol. 51, p. 280. (1st Oct., 1681).
 3. Ibid Vol. 52, p. 789. (5th Oct., 1681).
 4. R.P.C.S. Ser. III, Vol. VII, p. 288.
 5. A.P.S. Vol. VII, pp. 255-261.

He was, however, a highly skilled foreign engineer - but he was a Roman Catholic, for adherence to which faith he suffered considerable persecution. His first project, started in 1674, was bringing the first piped water supply to Edinburgh from springs at Comiston.¹ After this was satisfactorily completed he planned and constructed the harbour at Cockenzie for the Earl of Winton in 1678. There was a lawsuit about payment as the final size was larger than originally planned, but no suggestion of incompetence was made.² In February 1680 he was awarded two patents, one for a water pump for emptying mines or quarries and the other for an engine for cutting iron, mainly for nail makers.³ It seems reasonable to connect the pump with his first harbour project. The following year (1681) he obtained a sub-tack on the paper mill at Canonmills from the principal tacksman, John Paterson, and spent £1,000 Scots on it.⁴ He then applied for a patent for making and selling playing cards and this was granted to operate from 1st April, 1682.⁵ However, the mill was "broken down and rendered altogether useless" in March 1682 and Bruce brought an action against Paterson and a farmer of Canonmills, Alexander Hunter. In the course of the complaint it transpired that Bruce had built a second but smaller

1. Extracts from the records of the Burgh of Edinburgh 1665-1680 p.181.
(22nd May, 167)

2. R.P.C.S. Ser.III, Vol.VI, p.383.

3. Ibid p.406.

4. Ibid Vol.VII, p.502 and S.R.O. Register of Deeds Mackenzie office Vol.51,
p.280.

5. R.P.C.S. Ser.III, Vol.III, p.288.

paper mill at Canonmills and that the water was diverted from this and his wife, Louise Ghailej, was thrown into the dam. Hunter was found guilty of a riot and was fined £50 sterling to be paid to Bruce. Paterson was assoilzied¹ (acquitted). His next project no doubt arose from his troubles at Canonmills and in February 1683 he signed a contract with John Campbell of Woodsyde and James Peddie to erect a paper mill at Woodsyde near Glasgow. Campbell was to do some building and a programme was worked out to have a "going paper mill by 1st May, 1683". He gave up his mill at Canonmills, hired workmen for the Glasgow project and moved his family through to Woodside. Things were not ready, however, and the mill servants deserted. Bruce went to Holland for more in October or November 1683 and after his return got the mill going. Meantime he was summoned to Ayr to raise a ship which had sunk in the harbour. This he managed to do but on returning to Woodsyde found that Peddie and Campbell had been interfering with the workmen and the mill. Bruce had agreed to buy out Peddie's interest in the mill with 700 merks worth of blue and gray paper by 1st August, 1684, and it seems that the trouble at the mill was to prevent Bruce from fulfilling his bargain. He brought and won a case against Peddie and Campbell getting 1,000 merks for himself and 500 were to be paid to H.M. Cashkeeper for witnesses' expenses.²

1. Ibid p. 502.

2. Ibid Vol.X, p.93. The merk was valued at 13/4d. sterling.

In January 1685 he was imprisoned in the Glasgow Tolbooth for eight days in connection with the Peddie affair.¹ Later the same year, in October, he made proposals for the construction of a harbour at Elginhead, about three miles from Elgin. This was approved by the Privy Council in January 1686 but referred to the King.² Back in Edinburgh there were riots and molestations outside his house on three successive Sundays as services were being conducted within. Troops were called out from Holyrood to protect him and his guests.³ In February, again making paper in Edinburgh, he applied, with James Home, for the prohibition of the import of blue, grey and pressing papers and pasteboard.⁴ This was granted in December of the same year (1686).⁵ In December 1687 he was appointed printer to H.M. Household in succession to James Watson.⁶ The following December he was again in prison for some unspecified offence from which he petitioned for release in June 1687 when his colleague, James Home, stood as cautioner.⁷ Then in 1690 he disposed of his patent for playing cards and

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1. John A. Fairlie "The Old Tolbooth" extracts from the original records. B.O.F.C. Vol. XI, p.26.
 2. R.P.C.S. Ser.III, Vol.XI, pp.356, 450.
 3. Ibid.
 4. Ibid. Vol.XII, p.91.
 5. Ibid. Vol.XIII, pp.39,41.
 6. Ibid. p. LXIV. Books printed by Bruce in 1688 included The Faith of the Catholick Church concerning the Eucharist, The Christian Duvinal, and A Pastoral Letter from the four Catholic Bishops to the Lay Catholics of England. Quoted by Principal Lee in his Memorial for the Bible Societies in Scotland. Edinburgh. 1824, pp147,148.
 7. Ibid. pp.427, 449.

the mill he had built at Restalrig to James Hamilton of Little Ernock.¹ Thereafter he disappears from view. Perhaps the restoration of the Presbyterian church that year² made his position as a Roman Catholic in Scotland no longer tolerable, for though he brought many successful actions for patent infringements and for damages, his position in the community was much less secure than his position before the law. An engineer and inventor he built three paper mills and renovated a fourth. He became King's printer, and was able to produce sufficient blue and gray and pressing papers to convince the Privy Council that the importation of these items should be prohibited. He figured, usually successfully, in a number of lawsuits and in his fifteen years in Scotland was undoubtedly the most colourful entrepreneur of his time. His rewards were small but it can be said that he stamped the word 'Paper' on Scotland by means of his playing cards - and yet even in his day he was not alone in Scottish paper making.

This brief account of Peter Bruce's activities has carried us far beyond Scotland's second mill operated by him at Canonmills, but the chronological review will now be resumed.

The third mill was at Dalry, and this will be referred to as Dalry No.2 to distinguish it from the original sixteenth century paper mill of Mungo and Gideon Russell. The principal paper making partner in this

1. A.P.S. Vol.IX, p.340, 1693 Cap.83 confirming Act of 26 August, 1690.

2. Ibid, p.233, 7th June, 1690. Cap.7.

concern was Alexander Daes, a merchant burghess of Edinburgh. The co-partnery of six, all merchant burghesses, took a lease of the mill in December 1673.¹ They probably got it converted to paper making during 1674, for in January 1675 the Act of creating manufactures of 1662 was declared applicable to the enterprise.² For at least some of the work they brought in French craftsmen, among whom was Nicolas de Champ, who figured in various legal cases and subsequently established his own mill and became a burghess of Glasgow.³ Another was Peter de Laney who later was one of the members of the White Paper Makers Co. of England founded in 1686.⁴ The Dalry mill was destroyed by fire in 1675, but was rebuilt and "brought to considerable perfection in making gray and blue paper much finer than ever this country previously offered ...".⁵

A further reference to this mill occurred in a letter by Andrew S. Cunningham in reply to an article by Edington Aitken. In it he says ".... Sir Andrew Balfour who assisted in the formation of the Royal College of Surgeons taking residence in Edinburgh and projected and succeeded in introducing the manufacture of paper .

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1. S.R.O. Reg. of Deeds McKenzie Office 42, p.175. The partners were William Stevenson (Elder), William Home (Elder), Archibald Home, James Home, John Bertram and Alexander Daes.
 2. R.P.C.S. Ser.III, Vol.VI, p.142 and Vol.VII, p.338.
 3. The Burgess & Guild Brethren of Glasgow 1573-1750. Scottish Rec.Soc. p. 228, by purchase 15 Apr.1693.
 4. Robert Waterston's notebook.
 5. R.P.C.S. Ser.III, Vol.VI, p.142 and Vol.VII, p.338.

Balfour moved from St. Andrews to Edinburgh in 1670 and one is almost safe in assuming he was one of the originators of the little works which opened in 1676 and 1679 at which were made grey and blue papers much finer than ever before as a Scottish product.¹ This seems certainly to be referring to Dalry and though the "two mills" may conceal an unknown mill it seems likely to refer to the rebuilding after the fire. Balfour's name doesn't occur in the deeds so far discovered.

There seem to have been difficulties and re-alignments of partnership for there was another fire in 1679 and Daes temporarily became the showman of an elephant.² Nicolas de Champ borrowed £250 Scots from Archibald Home³ and when Daes returned to the Dalry mill he brought an action against Peter Bruce and James Lithgow for having enticed away de Champ.⁴ Bruce, it will be recalled, was at this time making paper at Canonmills and Lithgow started up the fourth Scottish mill, at Upper Spylaw, Colinton. This was in 1681 and with de Champ's help. The mill was still in Lithgow's possession in 1700 when he was offering it for sale.⁵

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1. Scotsman 30 June 1933 and Supplement, 29 June 1933.
 2. Fountainhall's decisions Vol.I, p.119, 1st Dec., 1680.
 3. S.R.O. Register of Deeds, Dalrymple Office 54, p.533.
 4. R.P.C.S. Ser.III, Vol.VII, p.338.
 5. Edinburgh Gazette No.181, 14-18 Nov. 1700 and Nos. 187-194.

He died in 1703 but his widow, Isabel Haliburton, carried on the lease at £85 Scots p.a. at least till 1707, paying part of it in paper to the owner, Sir John Foulis.¹ It seems possible that a nephew did the actual paper making for in December 1687 Lithgow signed an agreement with Robert Haliburton obliging himself "... to teach Robert Haliburton the art of making all sorts of paper that shall be made at the said mill".² The fate of the Dalry paper mill is not known. Alexander Daes died in May 1684³ and in May 1699 the mill had certainly reverted to corn.⁴

While Bruce was at Canonmills he suffered an attack on the mill and to keep going erected a second but smaller mill to run on the by-water.⁵ This was in 1682 and ranks as the fifth Scottish paper mill. Further trouble ensued and Bruce moved through to Woodside near Glasgow where the following year, 1683, he erected the first paper mill in the west of Scotland, the sixth in the country as a whole.⁶

Bruce experienced trouble also at Woodside as mentioned above. The

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1. Foulis of Ravelston Account Book 1671-1707. Scot. Hist. Soc. Vol. 16. 1 Jan. 1704, 5 Jan. 1705, 5 Jan. 1706, 3 Jan. 1707.
 2. S.R.O. Reg. of Deeds Durie Office LXXII, p. 351.
 3. S.R.O. Edinburgh Commissariat, 1 July, 1684.
 4. Edinburgh Gazette No. 19, 27 April - 1 May, 1699, "... to let ... Dalry Mills, three corn mills, kilns, the garner house, yards and dovecote with the dwelling house ..."
 5. R.P.C.S. Ser. III, Vol. VII, p. 502.
 6. R.P.C.S. Ser. III, Vol. X, p. 95.

mill, however, was large enough to take on apprentices and it produced blue (i.e. sugar bag paper) and grey paper. However, a year after his successful case against his landlord and partner, Bruce returned to Edinburgh and set up another mill, the seventh, at Restalrig, in 1686. In this project he had James Home (one of the Dalry co-partners) as his partner and the two applied for the prohibition of the importation of all grey, blue and pressing papers and pasteboards. They had, they said, '... brought home from several countries abroad persons able and willing to educate and learn others within this kingdom in that art ... and now are able to supply the whole kingdom with the foresaid coarse papers ...'¹ They seem to have been in a good way of business for they convinced the Privy Council, who decreed accordingly.² It seems likely that de Champ had left Lithgow at Upper Spylaw and joined Bruce on his return from Woodside. Lithgow raised a case in December 1685 in connection with an apprentice of his, James Hamilton, and in the course of the evidence it transpired that de Champ had "deserted",³ but he certainly had been there "to oversee the diligence and attendance" of Hamilton. Then on 1st May, 1686, Bruce granted a bond to John Campbell of Woodside and one of the witnesses who signed was 'Nicolas de Champs Servitor to Peter Bruce,'⁴ which being during the

1. R.P.C.S. Ser.III Vol.XIII, p.58.

2. Ibid. p.41.

3. Fountainhall Decisions, Vol.I, p.381.

4. S.R.O. Register of Deeds, Dalhousie Office Vol.LXX, p.159.

time that Bruce was operating at Restalrig makes it almost certain that he too was working there. The mill was on the River of Tumble which rose at Cowgatehead and flowed down the Canongate entering the sea between the Water of Leith and the Figgat burn.¹ On 26th August, 1690, was passed an Act of the Privy Council, transferring to James Hamilton of Little Earnock (who had been apprenticed to Nicol Lithgow at Upper Spylaw in 1683 or 4) the playing card monopoly which Peter Bruce had held since 1681.² In addition to the monopoly was "... a paper mill built by him (Bruce) at Restalrig with the house, materials and Engines belonging ... and two machines for friezing of cloth..." The mention of "Engines" almost certainly refers to the rag stampers of the period and it is not possible to derive the number of vats from the information. That this mill could have "supplied the whole kingdom" emphasises the smallness of the contemporary consumption rather than the largeness of the mill. A pack of cards made there by Hamilton in 1691 is in the National Library of Scotland so that the quality and designs can be assessed.³

It is not clear when Nicolas de Champ left Bruce's employ but it was certainly before 1690. He went through to the west and started a

1. Nat. Lib. Laurie's map of 1763 shows this.

2. Quoted in A.P.S. Vol.IX, p.340.

3. Nat. Lib. of Scotland. Lord Rosebery loan, pack of cards by James Hamilton of Little Earnock.

paper mill, the eighth in Scotland, at Cathcart. The writer on Cathcart in the Old Statistical Account said "One Nicholas de Champ ... having connected himself with an opulent family here, they conjunctly erected very large buildings for carrying on the paper manufacture."¹ There is no record of his marriage in the Cathcart records from October 1690 (when the records begin) to 1695.² Moreover, de Champ was made a Burgess of Glasgow, by purchase, on 15 April, 1693, which implies a certain financial standing.³ It seems probable that he started the mill in 1686 or 1687. This is certainly after the revocation of the Edict of Nantes but it is definite that de Champ was at Dalry in 1675 and the date of 1690 for the mill at Cathcart given in the New Statistical Account coupled with his refugee status is an error.⁴ Other writers have followed this theme⁵ but it is clear that de Champ comes from an earlier generation of French settlers, who came as a result of

1. O.S.A. Vol.V, p.344.

2. New Register House.

3. Burgess & Guild Brethren of Glasgow 1573-1750, Scottish Record Society, p.228.

4. N.S.A. Vol.VII, p.508.

5. e.g. George Eyre - Todd History of Glasgow (1931) Vol.II, p.412. "... coming to Scotland with his little daughter after the revocation of the Edict of Nantes, Nicholas Deschamps made a living for a time by picking up rags in the Glasgow streets, and in time saved enough to start a paper mill close by the old bridge of Cathcart ..." He seems to follow Smiles, The Huguenots, 1876 p.277 where the wording is the same.

encouragement by the Scottish government rather than of persecution by the French government. The mill continued to be operated till well into the nineteenth century. On the question of the date of Cathcart, it seems equally certain that the date 1679 given in the Glasgow Facies¹ is too early as there is the evidence of de Champ being "enticed" by Bruce in 1682, of having "deserted" Lithgow in 1685 and of being "Servitor to Bruce" in 1686.

The ninth mill was at Ayton in Berwickshire and its date was probably 1693. Information is sparse, but it is mentioned in the list of the subscribers to the Society of the White-writing and Printing paper manufactory of Scotland about which more is said below.

The list is in alphabetical order of christian names and contains "William Hume, Master of the Gray Paper Mill at Ayton".² Now in the group of the six partners of the 1674 Dalry 2 project were three Humes (Humes) and one of whom was William.³ Moreover in the book of Sassines for Berwickshire is a record of the transfer of land "... cum antiquo molendino di Ayton ..." entered in 1693.⁴ If indeed the Ayton papermaker Hume was one of the Dalry partners he may have gone to Ayton after papermaking at the Dalry mill ceased. This was some time

1. Glasgow Facies, A view of the City of Glasgow. Ed. J.F.S. Gordon DD. Glasgow 1872, Vol.II, p.1224.

2. See appendix. p.282.

3. See p. 23 note 1 above.

4. Berwickshire Register of Sassines, Vol.5, p.248. Possibly Netherbyres Mill on Ayton Castle estate.

between Alexander Daes' death in 1684 and May 1699 when the Dalry Mills were to let.¹ His interest in paper must have been considerable for him to have supported a paper company while being in that business himself, even though his product was restricted to the grey sorts. No information has been found about the closure of the mill which was probably about 1700. The Rev. Mr. George Home, writing in the Old Statistical Account in 1791, mentioned only "a paper mill lately erected"² Had the original lasted for any appreciable time, it is likely that some note of it would have occurred in the historical section on the parish.

The next two mills, the tenth and eleventh to be started, were both owned and operated by the same Company, "Society of the white writing and printing manufactory of Scotland". This was the Scots White Paper Manufactory which was floated as a joint-stock company in 1694.³ The promoters were Nicholas Dupin and Denis Manes. Dupin, a French Protestant, had had considerable experience in company promotion since his arrival in England in 1685 to assist John Briscoe. He had been concerned in six other successful floatations in England, Ireland and Scotland.⁴ The Scots White Paper Manufactory was on a considerably

1. See p25 note 4 above.

2. O.S.A. Vol.I. p.75. and some from the made.

3. Scott W.R. Joint Stock Companies before 1720 Vol.III, pp.181-5 and A.P.S. Vol.IX, p.429. & See Appendix p.275.

4. Scott W.R. Joint Stock Companies before 1720 Vol.III, pp.64, 71, 90, 92, 95, 101 and 167.

larger scale than any of the previous nine mills discussed, having a capital of £5,000 (sterling). In his petition to the Privy Council Dupin said "... the several attempts that have hitherto been made ... may have failed because such an undertaking could not be otherwise managed than by a Society or Incorporation, and required a competent general joint stock company to set up and carry on..."¹ Moreover he claimed expertise and economic advantages. He had, he said, arrived at "the art of making all sorts of fine paper moulds ... better ... and at a far cheaper rate... and whereas large timber is scarce in this kingdom, he and his associates have ... arts to make the greatest mortar and vessel for making of paper without timber..." Finally, they provided "several ingenious outlandish workmen to work and teach their art in this kingdom".² This last part was certainly carried out, for an agreement registered on 4th April, 1698, contains the specific proviso "that Dupin and Manes undertake to oversee the building of two paper mills ... and to remain for the period necessary to train ten apprentices ... two overseers whose work is at the vat, two couchers, two leveers, and two that look after the rags, mortars and beating stuff.. and two masters of salle which size and finish the paper."³ The company

1. A.P.S. Vol.IX, p.429.

2. Chambers. Domestic Annals of Scotland Vol.III, p.86.

3. S.R.O. Register of deeds Durie Office 4 Apr. 1698 quoted fully by Waterston B.O.E.C. Vol.XXV, p.62.

then set up their two mills, one at Braid on the Braid Burn¹ and the other at Yester near Giffordhall (East Lothian.)² The concern was also large enough to have a warehouse at Heriot's Bridge in the Grassmarket.³ Though a monopoly was applied for in 1694 and 1697 this was refused on the grounds that other mills were in existence.⁴ A prohibition of the use of linen rags for making candle wicks was applied for⁵ but it was not apparently granted though a similar request had been granted to Alexander Daes in 1679.⁶ It seems that although both the mills were operating after 1700, their connection with the Scots White Paper Manufactory ceased about 1703 or 1702.⁷ This aspect of the matter is fully documented by Waterston. It appears that Dupin and Manes were in financial difficulties as they signed bonds for quite trivial sums. As early

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1. S.R.O. Register of deed, Mackenzie Office 21 June 1698. Quoted by Waterston B.O.E.C. XXV, p.64.
 2. Parliamentary Papers 1698 Overture for an Act for the improvement of the White Paper Manufactory - quoted by W.R.Scott, Joint Stock Companies to 1720, Vol.III, p.183.
 3. Edinburgh Gazette No.7, 29 March 1699.
 4. Scott W.R. Joint Stock Companies to 1720 Vol.III, p.184 and W.R. Chambers Domestic Annals of Scotland, Vol.III, p.87 quoting "Privy Council Record".
 5. Parliamentary papers 1698 quoted by Scott Ibid, Vol.III, p.184.
 6. R.P.C.S. Ser.III, Vol.VI, p.142.
 7. Waterston mentions B.O.E.C. (Vol.XXVII, p.46) that for the Bank of Scotland notes "... Braidsmill received the contract in 1702 when the TACKSMAN had to provide rooms for four" This reference to Tacksman may indicate that by 1702 (rather than 1703 as detailed in the text) this mill was let off to a tenant or tacksman.

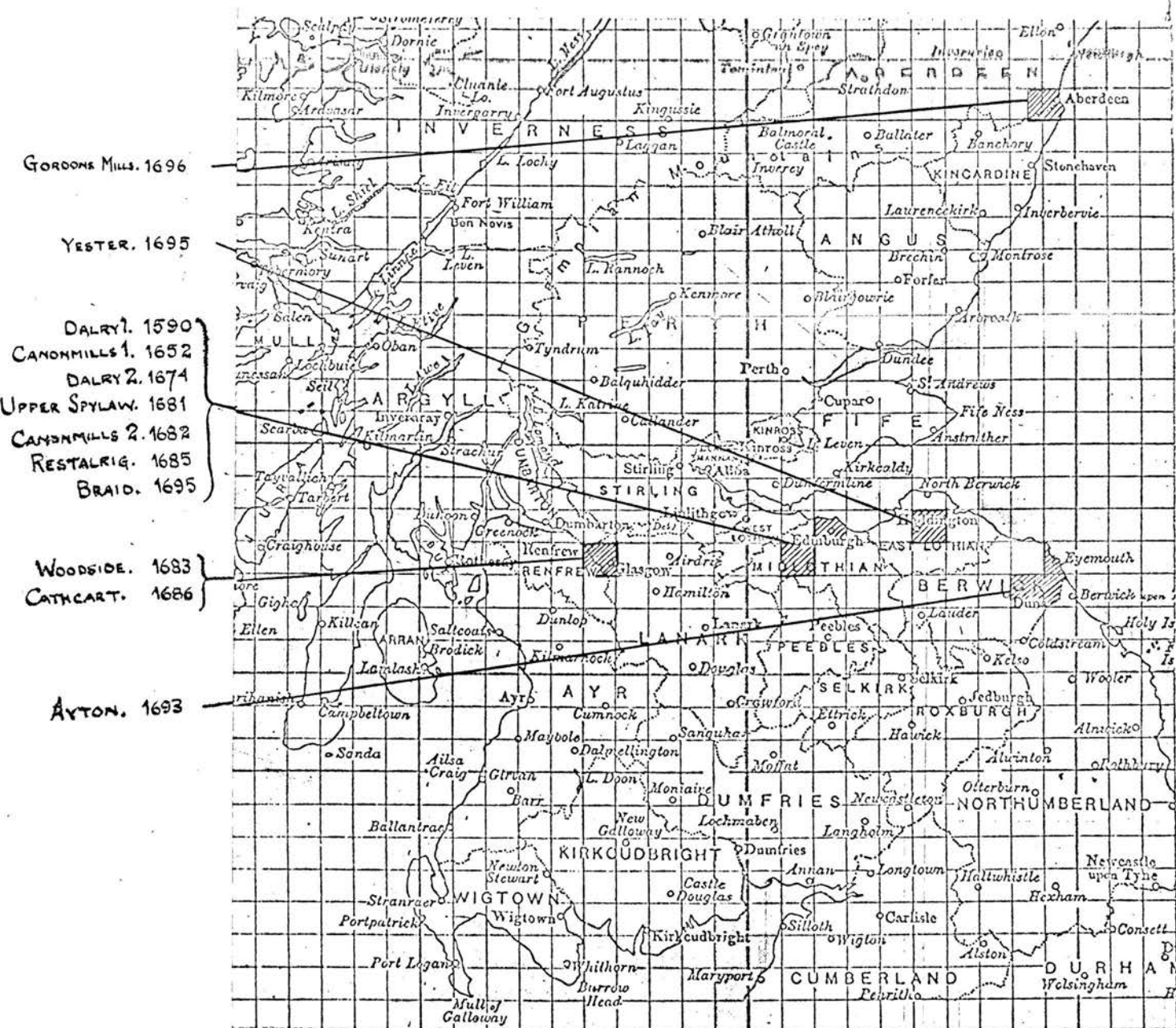
as 1697 Dupin signed a bond for 100 marks in July of that year.¹ In August, Manes signed one for £4 sterling² and in September Dupin was also borrowing £4 sterling.³ Then in 1703 a four year lease of both mills was signed by a group of men representing the Company. Under this lease, George Kerr and George Livingstone took over the mills and paid some arrears of feu duty and of rent.⁴ The mills themselves, as already mentioned, survived considerably beyond the year 1700. Braid was in action up to 1714⁵ while Yester was still operating at the time of the death of Richard Watkins in 1747⁶ and after various tenants was offered to let, still working, in June 1774.⁷ The Company, however, ceased to have control long before this and with a life of about eight years only, it seems that Dupin's original claim that "... such an undertaking could not be otherwise managed than by a Society or Incorporation, and required a competent general joint stock company to set up and carry on ..." was not borne out in practice. The failure of the Company can hardly be put down to lack of capital. Competition

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1. S.R.O. Register of Deeds Mackenzie Office 20 July 1698. (1 July, 1687).
 2. Ibid. 28 Sept., 1697 (18 Aug., 1687).
 3. Ibid. 20 July 1698 (9 Sept., 1687).
 4. Ibid. Durie Office 15 June 1708 (17 Sept., 1703).
 5. S.R.O. Edinburgh Commissariat 23 November 1714 (Peter Spence merchant).
 6. S.R.O. Estate A/cs. and rentals, Barony of Yester 1733-55, Box 4, G. D 28.
 7. Caledonian Mercury, Saturday 4th June 1774.

from England and Europe in good white paper and shortage of rags are possible causes. The Company itself had ideas on this matter and in an overture for an Act in 1698 complained "... that not only did the government abstain from using home-made paper, but that those who imported for official purposes ordered much larger quantities than were required, which were sold to the public ..."¹ Another possible cause of the Company's troubles may be indicated by the imprisonment of Robert Henderson, the Company's clerk, "for alleged embezzling the effects belonging to the said manufactory".² The success of the Watkins (Philip and Richard) with the same mills may well have been at least partly due to their own consumption as printers. An expanding market with the circulation of the Edinburgh Gazette and the start of the Courant in February 1705 no doubt contributed to their success. Moreover, if the aspersion cast by Dupin on "those who import for official purposes" implied the King's printers, then Richard Watkins, who was just that, may have seen to it that there was a stop put to the use of imported paper for government purposes.

The last of the twelve mills known to have been established before

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1. W.R. Scott, Joint Stock Companies to 1720, Vol.III, p.184.
 2. S.R.O. Reg. of deeds Durie Office, 10 June 1703.



GEOGRAPHICAL DISTRIBUTION of PAPER MILLS
IN SCOTLAND BEFORE 1700.

Fig. 1.

1700 was at Gordons Mills on the River Don, Aberdeen. This was not on the site of the present mill of that name, but was started in 1696 by Patrick Sandilands of Coton.¹ How long it continued is not known but Milne Cruden & Co., subsequently had their bleachfield at Gordons Mills.² It may be noted at this stage, that over the years many mills, while continuing to be driven by the water of the river or stream by which they were built, nevertheless changed their function. It will be seen from time to time, that mills were converted to paper mills, and that paper mills were converted to woollen mills, snuff mills, breweries, wauk mills to name but a few.³

The map (fig.1) shows the geographical distribution of these pre-eighteenth century mills, and it will be found that though other areas were subsequently developed, the Water of Leith, the Cart river area, Berwickshire, and the Don have remained paper making districts to this day. The most important paper making district to have developed since this time and to have remained, is the Fisk Valley - as will be shown later the most productive area in Scotland during the 19th century.

All these mills were water driven and presumably of the usual vertical wheel type, with the possible exception of that at Restalrig on

1. Kennedy, Annals of Aberdeen. Aberdeen 1818, Vol.2, p.204.

2. Ibid, p.201.

3. Edinburgh Advertiser 3rd August 1810, p.75, Col.2.

the river of Tumble, which may have had a horizontal wheel. The evidence is slender being only the existence to-day of "Clockmill Lane" and Clockmill Road in the district¹ and the mention of Clockmiln Park and the "lands of Clockmiln".² This type of mill is known to have existed at the Brandywine paper mill of Thomas & Joshua Gilpin in the 18th century³ but no other example has been noted, other than those common in corn mills in Shetland.

The quantities and qualities of the paper made

Evidence as to quantity and qualities of paper made at these mills is sparse. In the inventory of the effects of the widow of Thomas Bassandyne, first printer in Scotland of the New Testament and Bible, is recorded "XXVI j ryme Scotis prenting, price of the haill XXVII j Li. xijd".⁴ She died in 1593. This would seem to have been from the Dalry mill or possibly from some other, as yet untraced, mill. At Restalrig playing cards were made⁵ and a group of these is in the National Library of

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1. Clockmill Lane, Edinburgh 8. and Clockmill Road Edinburgh 7.
 2. Edinburgh Advertiser 6 May 1800, p.291 "... the superiority of the lands of BARBER alias CLOCKMILN lying on the east side of the King's Park at Holyroodhouse ..." Also Edinburgh Gazette No.77 16 Nov. 1699 "... Stolen yesterday out of Clockmiln Park a dark grey horse ..." ; of course even if it is established that there was a "clock mill" in this district it would still have to be proved that it was the Restalrig paper mill.
 3. John Gilpin, Journals, Pennsylvania State Archives Harrisburg PA. Vol.4 See Appendix. p. 318.
 4. Dickson & Edmund. Annals of Scottish Printing p.476.
 5. National Library of Scotland.

Scotland. The same product came also from Upper Spylaw mill.¹

Though Peter Bruce had a monopoly for making and selling playing cards² he certainly made other kinds of paper. As mentioned above in the account of Bruce's activities, in his Woodside mill he made blue and grey paper and bought out James Peddie's interest in the concern with 700 merks' worth of such paper.³ When he returned to Edinburgh in 1686 and was making paper at Restalrig in partnership with James Home he again made blue and grey paper as well as pressing papers and of course pasteboard, for he was granted the prohibition of the importation of such papers by the Privy Council⁴ on the ground that he was "able to supply the whole kingdom with the (foresaid) coarse papers."⁵

Of interest concerning the amount of paper that Bruce hoped to make at his first mill, at Canonmills, is the agreement he made on 5th October 1681 with his manager there, William Paterson.⁶ In the course of this, Paterson undertook "to make as much and as good paper every day as Nicolas de Champ and Peter Delaney"⁷ of the Dalry no.2 mill being run

1. Waterston R. B.O.E.C. Vol.XXVII, p.42.

2. R.P.C.S. Ser.III, Vol.VII, p.288.

3. Ibid, Vol.XI, pp.356, 450.

4. Ibid, Vol.XII, p.91 and Vol.XIII, pp.39,41.

5. Ibid, p.58.

6. S.R.O. Reg. of deeds Mackenzie Office, Vol.52, p.789 1 Aug., 1685.

7. Peter de Laney figures in a list of the fifteen members of the White Papers Makers Co. of England. (R. Waterston's notebook).

by Alexander Daes "... to accept of prentices and to teach and instruct them in the said art of paper making". Bruce on his part agreed to pay Paterson "... the sum of £250 Scots yearly .. and £1:4s. every week for each prentice ..." The agreement then went on "... and in case William Paterson shall think it more expedient to have the benefit of said paper work instead of £250 ... and £1.4s. ... then Peter Bruce will .. pay to Wm. Paterson Eight shillings Scots for each ream of grey paper and so proportionately for said ream of other paper that he shall work and make. .. Peter Bruce always furnishing sufficiency of cloth and materials for upholding the milne ..." From this it is clear that Bruce and Paterson thought £250 + £1:4s. per week per prentice was a fair reward for the work done. At 8/- per ream this postulates an output of some 625 reams. If two apprentices were taken, about 935 reams in the year or perhaps 20 reams per week, allowing for some idle weeks could be expected. This is not a high output, but it seems a good contemporary estimate, though we do not know just how Paterson was in fact paid. A further point of importance may, however, be deduced from the document. In the text Paterson agreed "to make as much and as good paper every day as Nicholas de Champ and Peter Delanoy" who were at Dalry No.2, working for Alexander Daes and his partners. It may reasonably be assumed that the Bruce-Paterson estimate for the Canonmills project was equal to, and based on, their estimate of the output of the Dalry mill. De Champ had not at this time left for Upper Spylaw¹ and so the total Scottish output of

1. R.P.C.S. Ser.III, Vol.VII, p.338.

paper can be said, on the basis of a contemporary estimate, to have been about 1800-2000 reams per annum in 1681. Imports, as will be seen presently, amounted to rather more than this, though no precise figures for the year 1681 are available.

No contemporary evidence of the qualities produced at Cathcart has been found, but writing some hundred years later, the Rev. Mr. David Dow in the O.S.A. says that the water of the Cart was often turbid, that bleachers had had to move to Neilston and the paper makers were prevented from carrying on their manufacture to any considerable perfection or extent.¹ It may well be that conditions were the same in the seventeenth century and its output restricted to very necessary but less-well-esteemed lapping paper and the coarser sorts of writing paper.

The Ayton mill can be credited with grey paper in the absence of any further information. Gordons Mill is reported as "producing all sorts of paper for several years",² which, though not specific, at least indicates a certain variety in excess of that attributed to Dalry No.2. According to The Scotsman letter already quoted, the mill(s) there produced grey and blue paper.³

1. O.S.A. Vol.5, p.344.

2. Gillis W.P.T.R. 26 April 1912.

3. Cunningham A.S. Letter in The Scotsman 30 June 1933.

More information both of quality and quantity of paper is available about the Scots White Paper Manufactory's two mills at Braid and at Yester. Both of these mills produced bank note paper for the Bank of Scotland, Braid in 1702 and Yester in 1700.¹ Then, two deeds in the Register House, found by Waterston, have the watermark "Company"² which seems certain to be the White Paper Company. Other deeds were also noted by him with watermarks "Braid" "Yester" and "Dupin".³ Investigation of certain issues of the Edinburgh Gazette in the Edinburgh University Library shows that they too have the watermark "Company" and some, "Dupin".⁴ In advertisements the Company claimed from March 1699 till July 1701 "... to have brought their manufacture to great perfection and .. have considerable quantities of Imperial, Writing, Printing, Pressing and Packing Paper, all very good and at reasonable prices"⁵ Thus from claim, report and paper still available for examination it seems that the variety of qualities and the quantity of paper being made in Scotland by 1700 were considerably greater than was

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1. Malcolm C.A. The Bank of Scotland 1696-1945, p.256 also Bank of Scotland, The General Ledger, p.78.
 2. S.R.O. Register of Deeds Mackenzie office 20 July 1698 (Deeds dates 1 July and 18 Aug., 1697).
 3. S.R.O. Deeds dated 17 March 1703, 20 June 1705 and 25 November 1700 respectively.
 4. Edinburgh University (Drummond Room), Edinburgh Gazette No.163 also Nos.10, 14, 23, and numerous others. Also (for "Dupin") Nos.9 (March 1699) 62, 101 and 131.
 5. Edinburgh Gazette Nos. 7-10, 12, 14 and 21.

supposed previously.¹

Evidence on quantities made is indeed sparse. One deed, noted by Waterston, lists considerable quantities of paper as being in stock in the Company's warehouse at Heriot's Bridge, Grassmarket. This deed is in effect a stock list as at 29th July 1699.² It is an obligation by Robert Henderson, Clerk to the Company, to be accountable to the conjoint tacksmen of the paper mills at Braid and Yester, as their store and warehouse keeper ... who have delivered to him ...

5 reams of Crown writing
72 rms. 12 quires Pott writing
87 rms. Crown printing
673 rms. Pott printing
322 rms. 2 quires Grey paper
24 gross Pressing papers
2 stone (less 14 shts.) Pasteboard
150 stone linen rags
138 stone sacking and mixed rags
24 stone scrowes.

This gives a total of more than 1159 reams which could well have weighed of the order of ten tons - quite a considerable quantity of paper for pre-1700 Scotland, though clearly it would be only a few months' supply.

1. Spicer A.D. The Paper Trade pp.71, 96, 97.

2. S.R.O. Register of deeds Durie office 10 June 1703. (29 July 1699).

There were at the time at least three other mills in operation, Cathcart, Restalrig and Upper Spylaw with the strong probability of Gordons Mills too. Between 1685 and 1696 the annual average Scottish imports of paper amounted to 6000 reams of which about half came through Leith.¹ Allowing for an increased consumption during and after these figures and for almost certainly reduced imports (due to the prohibition granted to Bruce and Home²) the contents of the Heriot's Bridge warehouse might nevertheless represent as much as five or six months' output of the Braid and Yester mills and giving an annual figure of the same order as that derived above for Canonmills in 1681. Some figures derived from the Excise returns may also be used for comparison; they apply to a date some twelve years after the Braid and Yester figures.³ When the excise tax was introduced in 1712, a survey was made of all the paper in stock in the country. The results were sub-divided to show the amounts of Imported and of British paper and each of these was divided to show the quantities in Edinburgh and in the country parts. The totals for the whole of Scotland were: Imported 3316 rms., British 3102 rms. For Edinburgh the amounts were 1707 rms. and 1746 rms. respectively and

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1. T.C. Smout, Scotland's overseas trade on the eve of Union p.285 and S.R.O. Leven & Melville papers for the year Nov. 1685-Nov.1686 when total imports were 4555 reams of which 2422 came through Leith.
 2. R.P.C.S. Ser.III, Vol.XIII, p.41.
 3. S.R.O. Excise accounts. "Abstract of the several quantities of Foreign and British Sope Paper, Silk, etc. in hand ... in that part of Great Britain called Scotland ..."

these percentages are of the same order as the Leith importation of 1685-6. From the quantities excised in 1712-13 it is felt that the country's stock represented about six months' consumption so that the 1159 reams of the Heriot's Bridge warehouse in 1699 would seem to have represented the supply needed for perhaps five or six months, and to show that there was not a very marked increase in paper consumption in Scotland between 1685 and 1712. The ratio of home-produced to total consumption in Scotland appears to agree with that given in the Case of the Paper Traders¹ for England at the same period.

By the end of the seventeenth century, paper making in Scotland can not be said to have been a large industry, comprising at the most some six or possibly nine vats.² The output of these might have been as much as 150-200 reams in a week. It is unlikely that the mills would all have been in operation throughout the year due to flooding, or drought, mechanical failure, temporary shortage of rags or even malicious action, so that an annual output figure computed from the "6-8 reams in 10 hours" given in the Edinburgh Encyclopaedia³ would be unrealistic. Nevertheless

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1. Case of the Paper Traders, quoted by Coleman (The British Paper Industry) p.58 footnote.
 2. Of the twelve mills traced, Dalry Nos.1 and 2 are known to have closed by 1700, (note 36n). Glasgow Woodside was out of production after 1686, the two Canonmills mills are not heard of after 1683. One completely untraced may have existed at Prestonfield. (Edinburgh Gazette Nos. 20, 21 May 1699 advert of "The Parks of Paper-milne, Prestonfield, Grange are now opened ...").
 3. Edinburgh Encyclopaedia, Vol.XVI, p.282, dated 1830, but the colophon gives 1823 for this volume.

there was the nucleus of a paper industry and in four areas a start had been made. That it owed much to European craftsmen is not surprising, as France, Germany and Holland were early in the paper making field, and Scotland was late. How far she caught up on so many of her neighbours will be seen as the study develops.

CHAPTER TWO

The Hand-made process as it operated in Scotland

For the manufacture of hand-made paper, the essential raw material was rags of linen and later, of cotton. Fundamentally the process consisted of re-arranging the cellulose fibres of the rags into a thin interlocking sheet. To achieve this re-arrangement, the fibres were suspended in water and, after treatment and drying, a sheet of paper was produced. The complete manufacture involved many processes and some of these required a high degree of skill. There were also certain modifications in some of the operations, which were determined either by the particular grade of paper being made, or by the quality of the rags available. Considerable detail in these aspects of the subject is available,¹ but for the purposes of this study what might be described as a layman's account of the manner of making paper, will be given. This is taken from the earliest known published account of Scottish papermaking.² It was prepared for the private use of the "Officers of Excise who survey paper-makers." The instructions, running to some ten pages, were issued personally to the officers concerned. They contained, in addition, details on the book entries, frequency of visits to mills, quantities of papers normally made in a day, and the avoidance and detection of frauds.³ The short

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1. Hunter D. Papermaking. 1947. New York.
Green J. B. 150 years of papermaking by hand. Maidstone 1960.
 2. Instructions for the Officers of Excise in Scotland. Sir D. Hunter Blair & J. Bruce. Edinburgh 1804, p. 293. Excise Library London (Only known copies).
 3. See Appendix. p. 283.

account of the mode of manufacture was clearly given to enable an ordinary exciseman to grasp the fundamentals of paper making.

“ Manner of making Paper.

The several sorts of paper are usually made of rags, ropes, cables, etc.; the writing and printing paper of the finer rags; the ordinary brown and whited brown paper of the coarser rags, ropes, etc.

The rags being sorted and washed, are put into mortars or engines; four or five hammers are used to each mortar, wherein they are beaten into half-stuff, then laid to mellow in tubs, bins, or chests, in some part of the mill or in an outhouse. When they are mellowed enough, they are beaten again in the mortars till made into fine stuff, and are then fit to be manufactured into paper.

In the mill there is a vessel called a vat or vat, wherein the stuff that hath been so beaten is put to a sufficient quantity of water, and kept at a certain degree of heat, about lukewarm; and this is the last preparation for paper.

According to the sorts and sizes of paper designed to be made, there are moulds to answer each size, (the bottoms of which are made of wire, somewhat resembling a fine sieve), which moulds are dipped into the vats, and by the dexterity and skill of the workman, are so handled, that the water runs through the wires of the moulds, and the beaten stuff only remaining therein, is gently turned off, or laid on a woollen cloth called a felt, and

appears thereon as a perfect sheet of paper; then another felt is laid upon that sheet, and again another sheet upon that felt, and so on till they have raised a heap of seven or eight quires, which is called a post. Sometimes the workman will vary and make but five quires in a post; which post being put into a press, and pressed very hard together, till the water is squeezed out, is immediately taken out again, and the sheets being taken from the felts, are laid one upon the other until the next day, and then hung in parcels of three, four, five sheets, or more, in each parcel, upon lines (usually called trebles) in a drying-house, where they have no certain time of hanging; but in the winter they hang much longer than in the summer. When the sheets are dry, they are taken down, flatted, and laid in piles, and then sized, that is, wetted in size; after that, the quantity of several reams being put one upon another, they are again pressed, a sufficient quantity of size being left therein for the bearing of ink.

Then they are hung up for drying a second time, in parcels of three or four sheets; and when dry again, are taken down from the lines; the broken sheets are separated from the good, and both counted into quires; after that they are pressed two or three times till made smooth, then tied up into reams for sale, viz., eighteen of the good quires, and two of the broken to each ream.

Brown and whited brown papers are made after the same manner, but sooner finished, being unsized, and but once hung up to dry before pressed, and made up into reams for sale."

One process not mentioned in this account was glazing, to the extent required for the particular type of paper. Finally the picking, to remove knots or small blemishes, was carried out prior to the counting and wrapping. This finishing work was all carried out in the Salle.

Figs. 1 & 2 are reproduced from Joshua Gilpin's Journal.¹ They show the layout of William Simpson's mill at Lasswade and of the larger and more ambitious Melville Mill. This latter, said Gilpin, "was on a much better plan." It was started before 1764 and lasted at least till 1825 though nothing of it now remains. In these sketches are marked the various rooms, and it will be found helpful to refer the processes to be described to the diagrams, to see from two quite different examples of mill layout, how and where things were done. In the diagrams it can be seen that Simpson's mill had two beaters and four vats. The larger Melville Mill had evidently five beaters (but room to accommodate eight) and six vats.

Consideration will now be given to these various processes in making paper and in particular to the evidence of their specific use and cost in Scotland. One early and extremely interesting list of paper mill occupations occurs in a deed of 1698.² The list runs:- "two oversiers whose work is

1. For detail on Joshua Gilpin and his journal. See Appendix p. 301.

2. S.R.O. Register of Deeds Durie Office 4 Apr. 1698. Quoted by Waterston B.O.E.C.XXV p. 62.

at the fatt, two cocheers, two leveers and two that lookes after the rags, the morters and beating stuff, commonly called governours, and two masters of salls which size and finish the paper." This basic staffing of paper mills as used by the Scots White Paper Company remained substantially unchanged throughout the hand-made era.

The Rags, their supply and sorting.

Rags were sometimes bought unsorted from local collectors or dealers.¹ This, however, did not account for the bulk of the supplies. Sorted rags commanded higher prices, for they guaranteed the presence of specific sorts of rag and were more convenient for the paper maker. As early as 1756, the collection of rags for paper making was being encouraged by the Edinburgh Society.² It offered a premium of two guineas to "the gatherer of the greatest quantity of superfine rags of muslin, cambrick lawn and finest linen ... worth five shillings per stone and upwards." Other grades were "fine rags, comprehending linen, cotton, muslin, etc. ... worth

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1. Esk Mills documents (Cash Book) contain entries for rags:- Alex. Robertson 18/8, John Rodgers per William Pennycook £3:7:9, Wm. McKenzie £1:15:6, John Clark £1:4:5, John Hogg £1:5:8, George Fairbairn (Pennycuik) £1:3:1. Though several of these names recur in the book, such quantities, though bought, did not constitute the main supply for the mill.
 2. The Edinburgh Society for encouraging Arts Sciences Manufactures and Agriculture in Scotland. Scots Magazine February 1756 and Appendix. p343.

from 3 shillings to 5 shillings per stone" and "comprehending all sorts of linen, towelling, etc. that have passed through the process of bleaching, and blue checks, worth from 14 pence to 6 pence per stone." This was perhaps a portent of things to come: already the local supplies of the finest rags were less than the trade needed. In subsequent years the Edinburgh Society made prize offers for rags "worth fourteen pence per stone and upwards,¹ and paid out their guinea to Janet Mitchell of Tranent who led the field with a collection of 606 stones of rags.² In all, in 1757, prizes were paid out on a total collection of some 4050 stones (25 tons) of rags. Even this sort of encouragement to local activity was not sufficient to meet the needs of the trade. Though papermakers continued to make such local purchases as they could, something on a larger scale was needed. In 1793 was established a General Rag Warehouse.³ "the greatest concern of its kind ever carried on in Edinburgh." This enterprise continued in business for 5 years, expending nearly £40,000 on rags. The proprietors were papermakers who felt the need of security in the matter of rag supplies. A considerable amount of information on the 18th century rag trade, its organisation and its prices, is provided in the Court of Session case noted

1. Scots Magazine March 1757.

2. Ibid January 1758.

3. O.S.F 206 No. 8.

above. A point well established from this is that from quite early times rags were certainly sold, classified, if not sorted. The main classifications were Superfine, Fine, Blue, Second and Grey ranging in price (in 1792) from 6/- to 8d. per stone.

If the rags were mixed on arrival at the mill, there would clearly be a necessity for sorting, but this was also the case with those bought as classified. Buttons had to be removed, and colour and other mis-sorts had to be put right. Women were usually employed for this work at about 10d. per day. It seems that when sorting classified rags, rather more than two hundredweight was the daily average for a woman.¹ When, however, the supply was mixed, the amount seems to have fallen to about $\frac{1}{2}$ cwt. per day.² Young persons were also employed on this type of work and the employment of children was specifically mentioned in the 18th century at Ayton (Berwickshire) and at Currie (Midlothian).³

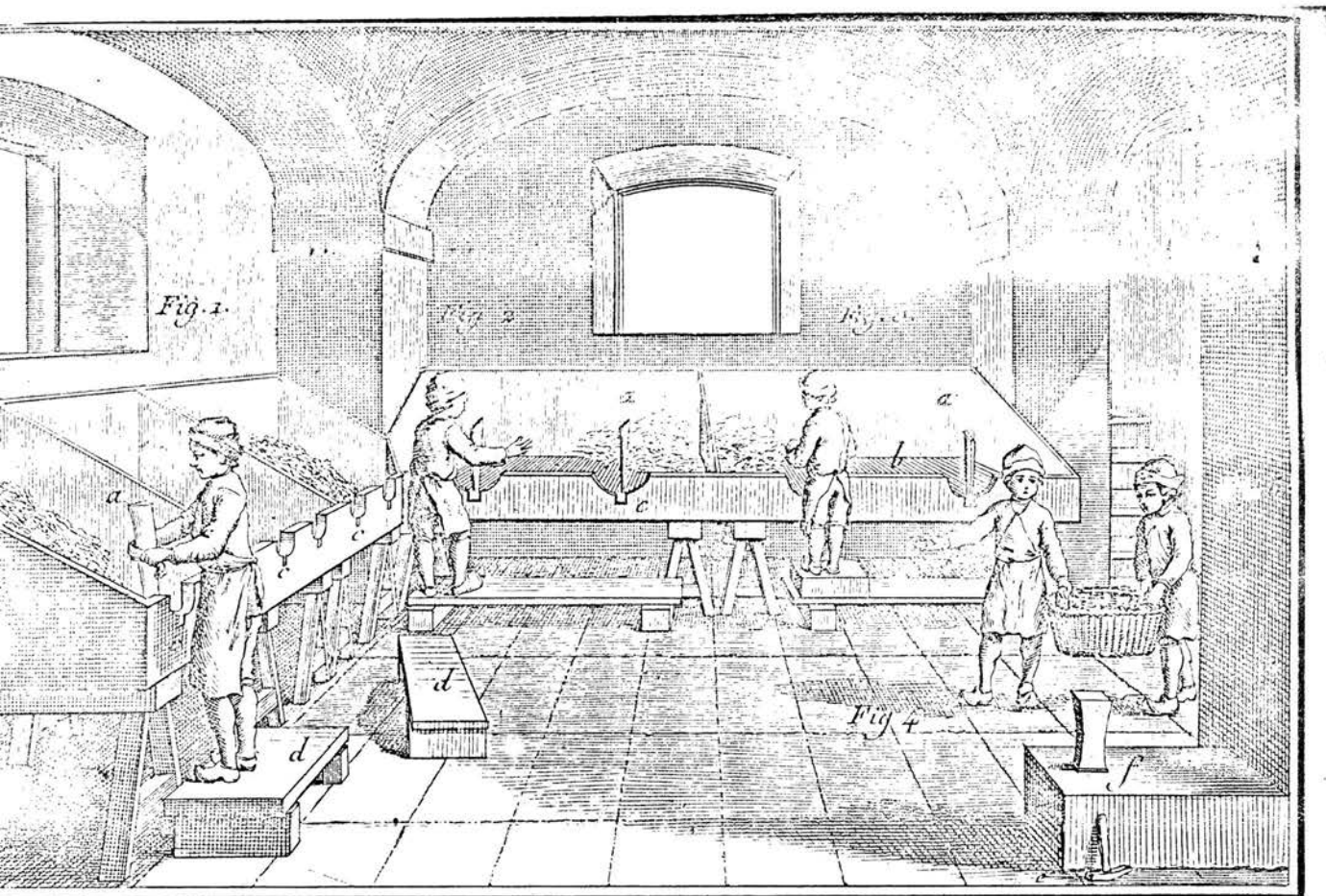
The work of sorting rags was carried out in what was known as a "rag-house". This might well be a separate building, but often was just a room or loft set aside for the purpose. Mention of such a place specifically for rag work has not been noted before 1793 when a "rag-loft" is mentioned

1. Tullis Russell Documents. Memo book p. 49. Quantities of rags sorted per day.

2. Cowan Documents. Wages Book C.

3. O. S. A. 1. p. 83. Young persons taken in at age 8.
V. p. 323. Employs young persons from 10-12 years old.





Diderot.

FIG. 3.

at Simpson's Mill at Polton (Midlothian).¹ It is probable that in the early part of the century sorting would be done in some convenient corner of the mill.

The sorting process itself was carried out at tables covered with wire netting of about three meshes to the inch. At the front of the table was fixed part of a scythe blade, about a foot long. On the left side of the table were the unsorted and uncut rags while on the right was a box divided into several compartments. The wire tops of the tables allowed a certain amount of dust to fall through and the rags were cut into pieces about four inches square by drawing them up the blade. Fig. 3 shows one arrangement of a sorting room. Further dust removal was sometimes achieved by mechanical means in a rag duster wheel or cylinder. This device was in the form of a cylinder about 6 ft. long and 4 ft. in diameter, covered with wirecloth similar to that used for the rag tables. Inside the wheel or cylinder, protruding from the axle, were spokes about 20 inches long. When charged with rags, the wheel was set revolving from the mill-wheel shaft and the spokes prevented the rags from remaining in a mass. For about half-an-hour the rotation continued, the dust passing outwards through the wire meshes into the raghouse itself.²

1. Sun Fire Insurance Policy No. 615222.

2. Edinburgh Encyclopaedia Vol. XVI pp. 280, 281. (1830)

Confirmation of these pieces of apparatus comes from inventories of 1791 and 1795 and the items are listed as

"a range of rag benches £2"

"two rag tables with ten boxes and wire grates £6"

and "one rag duster wheel¹ (no price quoted).

Summarising, the work just described might be called the dry-process work. Performed by women, with juvenile help, it consisted of sorting, removing dust and cutting into suitable small pieces the rags which were delivered to the mill. This use of a waste product was a feature of the industry which still affected the outlook of some of its important operators as late as 1861.²

Rag Bleaching.

In the early days, the colour of the paper was largely determined by the colour of the rags used. Of course, some partial bleaching was effected before the latter part of the 18th century by the use of lees,³

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1. Herbertshire documents.
 2. Report from Committee on Paper (Export duty on rags) P.P. Vol. XI 1861 Question 558 "... The principle laid down was that nothing was used for making paper, except refuse, because if it was an article of value, it would be used in other and more valuable things ..." also questions 548, 549.
 3. A mixture of quicklime and pearl ash in excess water.

and exposure to the sun, but it was not until chlorine was discovered that adequate bleaching to white was possible. In 1774 Karl Wilhelm Scheele (1742-86) of Sweden discovered chlorine. In 1786 the French chemist, C. L. Berthollet, published a work specifically on the bleaching effects of chlorine. In 1790 William Creech of Edinburgh published an essay by Robert Kerr on the new method of bleaching "... from the French of Mr. Berthollet".¹ In view of the amount of published material on the subject it is perhaps surprising that an English patent for the idea was granted to Clement and George Taylor in March 1792 and a Scottish patent on 4th July of the same year.² This patent was opposed by the Scottish papermakers and by a booklet published in the same year.³

As will be shown presently, they continued with their practice and development of chlorine bleaching. In 1794, however, a further Scottish patent was granted to William Cunningham, Chymist, of Edinburgh.⁴

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1. Kerr Robert' Essay on the new method of bleaching by means of oxygenated muriatic acid ... from the French of Mr. Berthollet with figures of all the necessary apparatus and explanatory notes, pub. WM. Creech, Edinburgh, 1790.
 2. S.R.O. Chancery specifications of patents and drawings (Box 2 1790-1793).
 3. "Memorial relative to the invention of a New Method of bleaching showing the absurdity of any pretensions to an exclusive privilege for using it in the paper manufacture."
 4. S.R.O. Chancery Specifications of patents and drawings (Box 3).

This patent was opposed by a consortium of eight Scottish papermakers¹ by means of an action in the Court of Session.² From evidence led in this long and inconclusive case it is clear that Wm. Simpson employed "oxygenated muriatic acid" (as chlorine was then known) "in bleaching or whitening his paper stuff as early as the year 1791." This does not ante-date the claim of James Whatman that the first experiment in this line was by Mr. Patch of Carshalton, but it seems to have been as early a "production use" as is known, and certainly the first in Scotland. Simpson moreover does not seem to have been at all secretive about his methods as is shown by the letter from Joshua Gilpin, the American papermaker, to his brother Thomas in Delaware - "This gentleman (Simpson) in a handsome manner communicated to me all his process ..."³ In his Journal, Joshua wrote in detail of Simpson's methods, with sketches and information on the suppliers of parts of his apparatus for the preparation of gas.⁴ This interest of Gilpin's in the chlorine process is significant, since the Gilpins' was the first instance of the use of chlorine

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1. Wm. Simpson, Polton, Balfour & Sons, Collinton, Strachan & Cameron, Springfield, Walker & Co., Kinleith, Nisbet & McNiven, Balerno, John Pitcairn, Melville, William Cadell, Auchendinny, and the Broomhouse Paper Company.
 2. Signet Library. Old Session Papers Vol. 207, 3.
 3. Gilpin letters in possession Dr. S. Edelstein. See Appendix pp. 323 & 324.
 4. Gilpin Joshua. Journals Vol. IV. See Appendix p. 311-315 & 319-321.

in the paper industry in America.¹ From the above information, from the Court of Session petition² and from one of the Herbertshire inventories,³ it seems that by 1791 Simpson was using chlorine for bleaching rags, that by 1795 at least nine Scottish papermakers were probably using the method, in addition to the operator at Herbertshire and his associates at Springfield - a fairly general and certainly early application of chemical science to paper making.

It should be noted that the significance of this application of chlorine in paper making lay in its use for the bleaching of the rags. These, as has been mentioned, were of the nature of waste. Although chlorine bleaching was quickly adopted in the cotton and muslin manufacture, there was a feeling that it would be too expensive to evolve a process for the treatment of rags.⁴ In Scotland, therefore, it is to William Simpson that the credit is due

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1. Edelstein Sydney. Papermaker Joshua Gilpin introduces the chemical approach to papermaking in the United States. Paper Maker Vol. 30 No. 2. 1961.
 2. O.S.P. 207.3 A further instance quoted in the case is "... Towards the beginning of May 1794 Mr. Hall, an English engineer ... had come down to fit up a bleaching apparatus for Mr. Pitcairn ... (who was at this time operating Melville Mill and the Broomhouse Paper Mill Company at Duns).
 3. Herbertshire Documents. Inventory No. 3. Strachan Laing Items 3 & 4.
Apparatus of the Bleaching with furnace £30.
Eight vats and chests in Bleaching House £35.
 4. Edelstein S. "Papermaker Joshua Gilpin ..." Paper Maker Vol. 30 no. 2. Gilpin's letter "... At Glasgow I saw no application of the bleaching process to rags, but I found the cotton and muslin manufacturers making and using the bleaching liquor ... I found Messrs. Robinson, Father and Son, large muslin manufacturers making the bleaching liquor in retorts ... on conversing with Mr. R. ... he seemed to think it too expensive for rags and recommended bleaching, them by spreading on the grass and using lime, alkalies, leas."

for showing that a process could be used successfully. Perhaps even more praise-worthy was his open-handed dealing and disseminating of his experience to the industry. According to the Court of Session case this extended even to William Cunningham (Charles Cowan's protégé) who obtained the 1794 patent.¹

The importance of the process to the industry as a whole was in greatly expanding the amount of rags available for paper making. With the expansion of the industry even up to 1790 a shortage of rags was developing. With the increasing population (about ten thousand per year at this period) and the rising output of cotton, one might have expected both old rags and mill waste to have helped meet the shortage. However much of the cotton was dyed and so was not directly suitable for the better grades of paper. By making this hitherto unsuitable material useful for paper-making, chlorine bleaching did much to ease the raw material shortage in the industry. A further, and far-reaching, effect was that the widespread use of chlorine meant the introduction of chemical processing to the industry.

The use and consumption of chemicals increased rapidly during the nineteenth century. Thus in 1807 the five mills at Melville, Polton and Valleyfield² were reported to have bought some 8 tons of alum, bleaching

1. O.S.P. Vol. 207.3.

2. The three mills Bank, Valleyfield and Low were costed by Alexander Cowan & Sons as one unit. In 1807 St. Leonards (then known as Lasswade was also being worked by Cowans but this fact is not mentioned in the Session Case.

powder, potash, soda and vitriol plus 20 casks of manganese. Though the annual amounts varied, the range and quantities of chemicals they used increased, so that in 1827 the purchases by the same mills amounted to 75 tons. The annual consumption by mills in the Esk Valley rose from 150 tons in 1836 to 1276 tons in 1860. During this period the output of the industry was also rising sharply, so a figure for the consumption of chemicals per ton of paper produced is also given. This figure showed nearly a three fold rise from 170 to 425 lb./ton. As indicated in the table the series do not cover the same mills for each year quoted (due to temporary closure, repairs, etc.) but the great increase in chemicals used is clearly seen.¹ As mentioned above, the introduction of chlorine bleaching did much to stimulate "chemical-mindedness" in Scottish papermakers.

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1. The consumption of chemicals and their disposal is very fully dealt with in the famous pollution case (The Duke of Buccleugh and others v. Cowan and others) which as a Jury trial lasted from 30th July - 10th August 1866 and in November of the same year went before the second division of the Court of Session. The reports of these two occupied 415 pages and 406 pages respectively.

lb/ton.

700

600

500

400

300

200

100

0

1800

1810

1820

1830

1840

1850

1860

CONSUMPTION of CHEMICALS.

lb PER TON of PAPER

TONS per Mill per Ann.

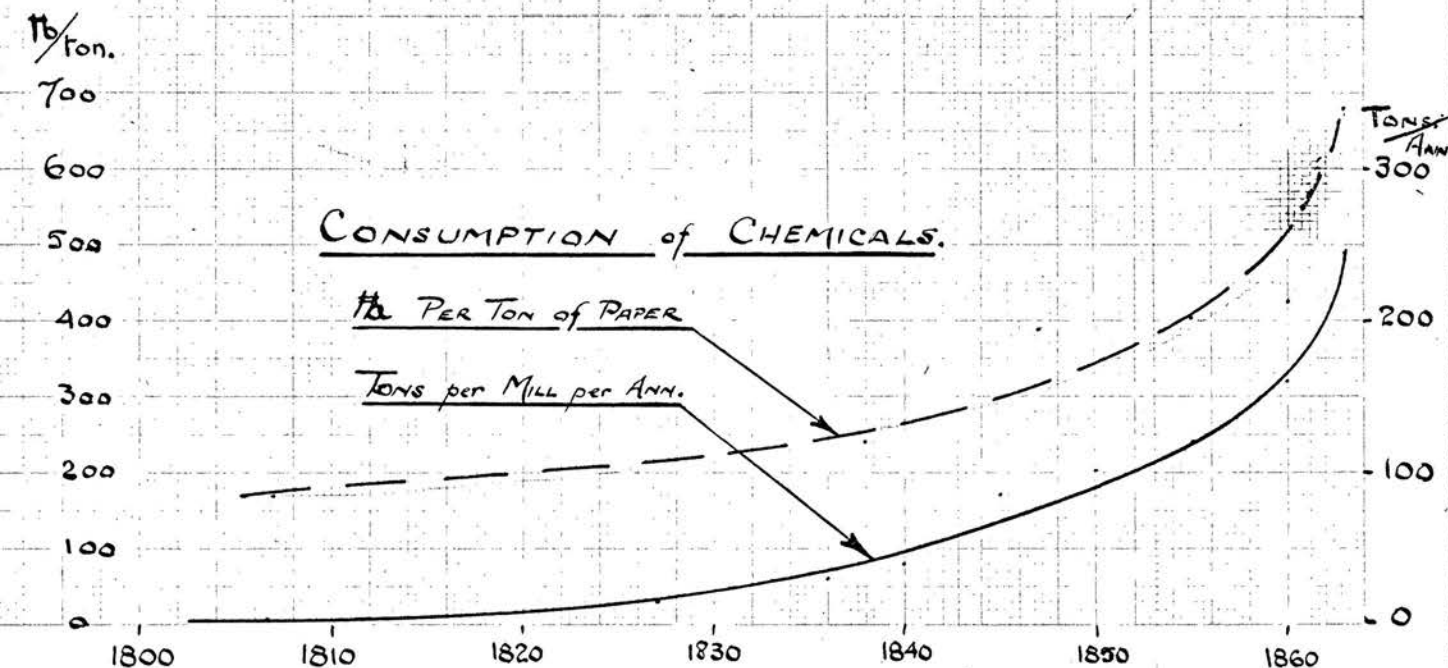
TONS
Ann

300

200

100

0



"CONSUMPTION OF CHEMICALS BY VARIOUS MILLS ON THE ESK"

Table. 1 ¹ .					Table. 2 ² .		
Year	Quantity (tons)	No. of Mills	Mills	Average (tons/ mill/an.)	Average lb./ton of paper)	No. of Mills	Mills
1807	8	5	a, b, c.	1 1/2	170	4	c, f.
1827	75	5	a, b, c.	15			
1836	150	5	b, c, d.	30	240	6	b, c, d, e.
1840	238	6	b, c, d, e.	40			
1845	600	7	b, c, d, e, f.	86	384	9	b, c, d, e, f, g, h.
1850	708	7	b, c, e, f, g.	101			
1855	837	7	b, c, d, e, g.	120	403	8	b, c, e, f, g, h.
1860	1276	8	b, c, e, f, g, h.	160	425	8	b, c, e, f, g, h.
1863	1986	8	b, c, e, f, g, h.	246	680	8	b, c, e, f, g, h.

a = Melville. b = Polton c = Valleyfield, Low & Bank. d = Springfield.
e = Dalmore. f = St. Leonards. g = Kevoek. h = Esk.

1. Derived from nos. 390, 396 and 402 of process. Session Papers Vol. 595 no. 55.
2. Derived from "Statement showing quantities of chemicals ..." Report of Jury Trial. Edinburgh 1866. Appendix.

The Wet Process - reduction of rags to fibres

The next part of the manufacture of paper was a wet process in which the individual cellulose fibres were separated out from the rags. This consisted of reducing the cut pieces of sorted rag to pulp suitable for use in the vats. Three methods of achieving this must be considered.

a. The Rotting Process

According to Diderot,¹ writing in 1763, the earliest method consisted of wetting the rags, piling them up and allowing them to ferment for from 6 to 20 days. The process was regulated to avoid fungal growth and actual rotting which, when it happened, is thought by Dard Hunter to have been a possible cause of the foxing so often seen as small brown spots on old book papers.² No evidence of this method of treatment having been used in Scotland has been found though it may have been operated in conjunction with the mortar and pestle engines described below. It is included here as it is known to have been used in the French trade, and Scottish practice, as will be seen throughout this chapter, followed quite closely the French pattern. This is perhaps not surprising as there were strong Franco-Scottish connections. In paper making itself, even though the earliest foreign worker was German or possibly Dutch³ there was a strong French influence in the latter part of the 17th century and extending into the 18th century. This was the period when the industry was really becoming established,

1. Diderot & d'Alembert Encyclopaedia Neufchatel, 1763.

2. Hunter D. Papermaking New York 1949 p. 134 footnote.

3. Chapter 1 p. 16.

when traditions and trends would be set. Thus we find Nicholas de Champ making paper at Dalry in April 1681¹ and later founding a mill at Cathcart.² Dupin and de Manes were both connected with mills at Braid and at Yester, near Giffordhall in 1695.³

b. Mortar and pestle engines

The method of piling to rot was abandoned early in the 18th century and the cut rags were then put straight into the pounding machines. These consisted of a series of from two to seven separate mortar-like holes in a block of wood or stone. If of wood, the bottoms were iron-lined and in either case there was a drain to allow excess water to pass away. Vertically disposed, and working in the mortars were iron-shod wooden pestles, caused to rise and allowed to fall by cams operated from the water-wheel. in a manner similar to that of the tilt-hammer. The Edinburgh Encyclopaedia says, "till within about sixty years, paper was made by means of stampers or hammers which still continue to be used in most of the French and Italian mills."⁴ This volume XVI was printed by A. Balfour and Co. Edinburgh in 1823, so that the date given for the end of the use of stampers would be c. 1760. Waterston gives their use as "... till the end of the 18th century!"⁵ The recently found "Instructions to

1. S.R.O. Dalrymple Office 54 p. 533.

2. O.S.A. 8. 344.

3. Chapter 1p.30.

4. Edinburgh Encyclopaedia Vol. XVI p. 282.

5. Waterston B. O. E. C. Vol. XXV. p.58.

Officers of Excise" quoted at the beginning of this chapter favours this latter period and indicates a later date for its use in Scotland than had previously been thought to have been the case. The process itself was slow as it required about twenty mortars working night and day to prepare a hundredweight of rags¹ - a quantity which would keep two men and a boy employed at the vat for about 10 hours.²

c. The Hollander.

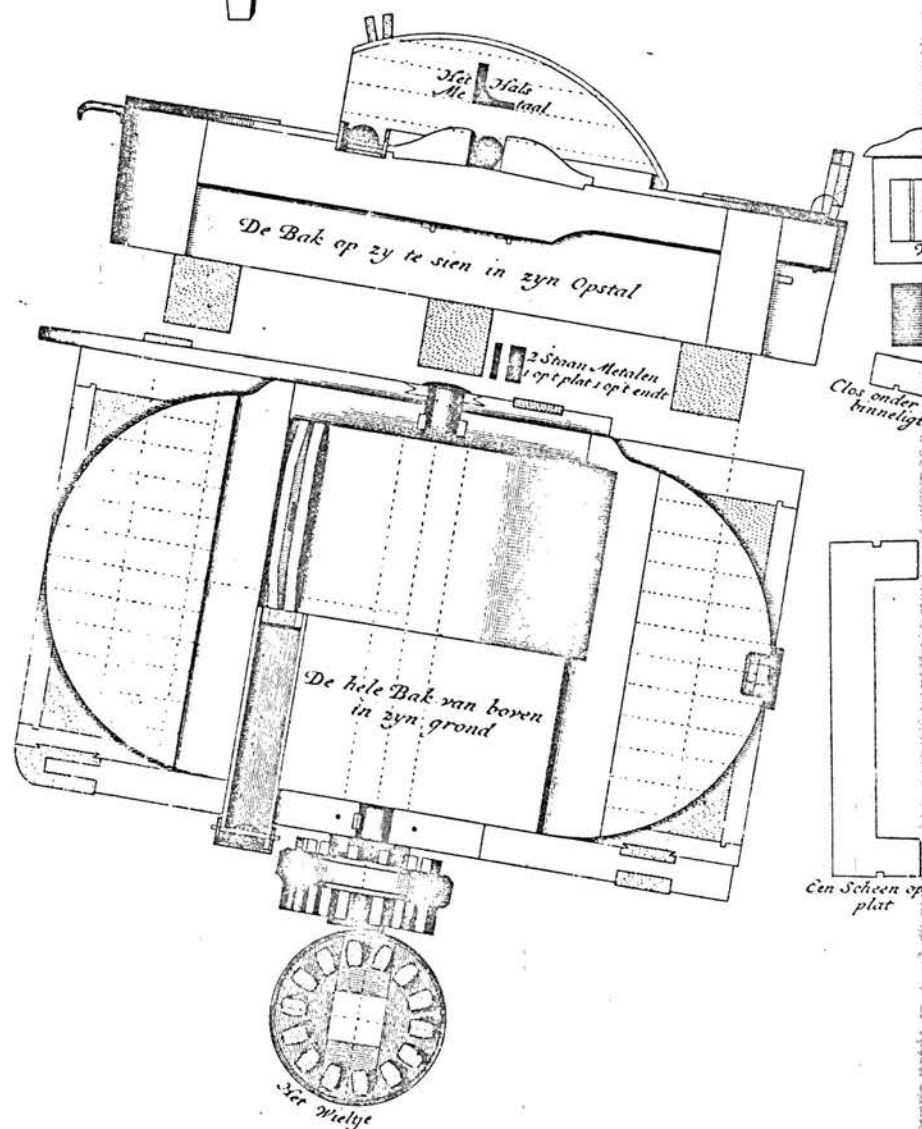
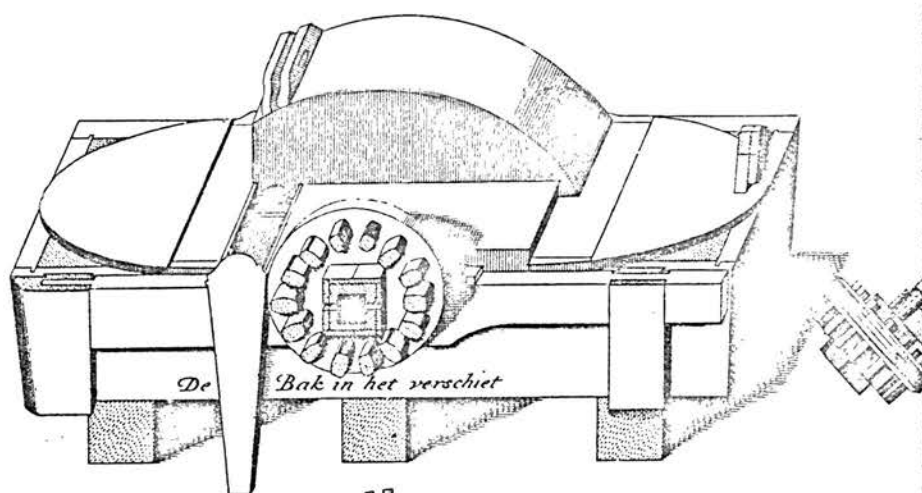
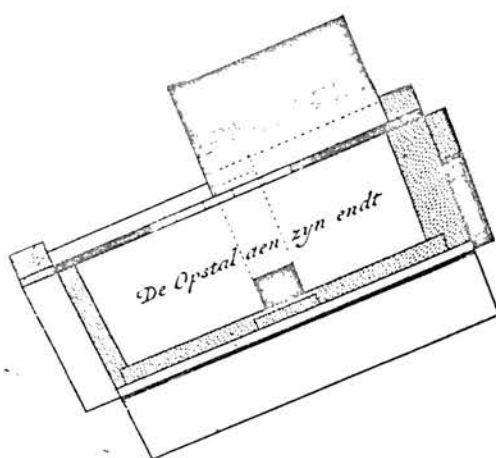
About 100 years before this, some time between 1630 and 1665 there was developed from the Dutch windmill-driven edge-runner, a machine variously known as a Hollander, a Beater, a Hollander Beater or simply an Engine, keeping the old word.³ It may be that secrecy was a better security than a patent in this age. It will be recalled that it was from travelling in Holland that Elizabeth Carnegie, who married Fletcher of Saltoun, found out enough information to start the first, and for many years the only, Barley Mill in Scotland. This was in 1720. Faujas St. Fond writing in 1784 relates what strict security regulations were in force at the Carron Iron Works and how at Prestonpans, the vitriol plant (then the largest in the world) was surrounded by a wall so high that not even the chimney tops could be seen from without.⁴ It seems that the Dutch were successfully secretive about the Hollander for nearly a hundred years. It may have been that

1. Edinburgh Encyclopaedia Vol. XVI p. 280.

2. *Ibid* p.

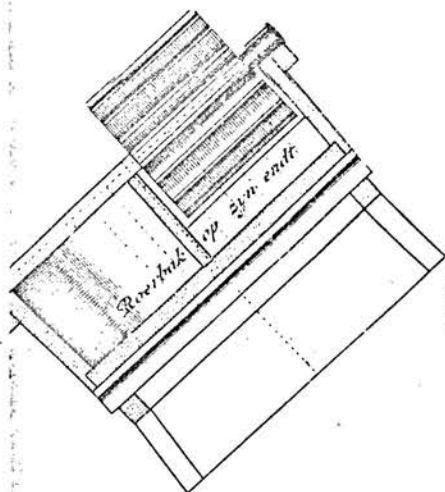
3. Voorn Henk. On the invention of the Hollander Beater - The Paper Maker Vol. 25 No. 2. 1956.

4. Faujas St. Fond. Travels in England & Scotland 1784. Ed. Sir Archd. Geikie 1907. Vol. 1, pp. 174, 178 & 9.

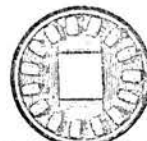
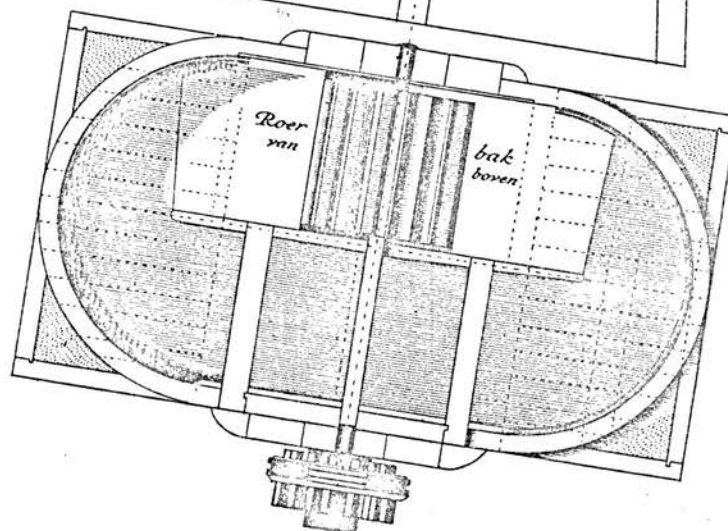
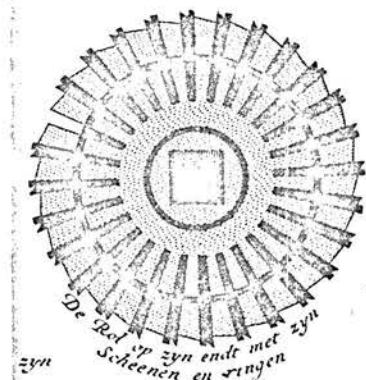
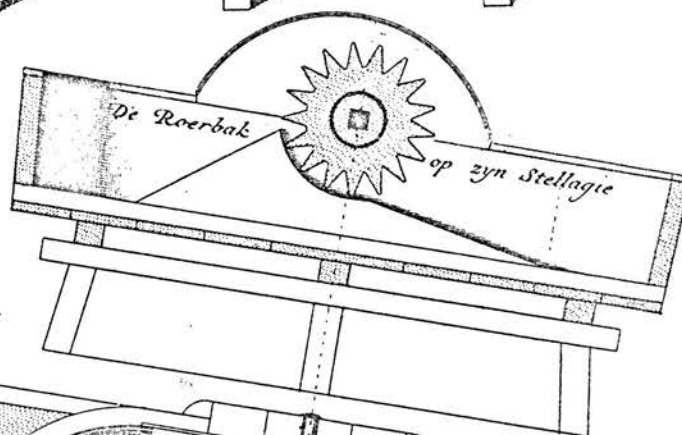
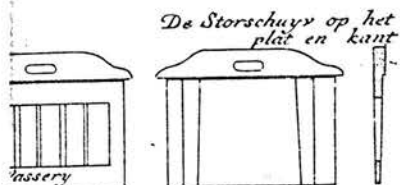
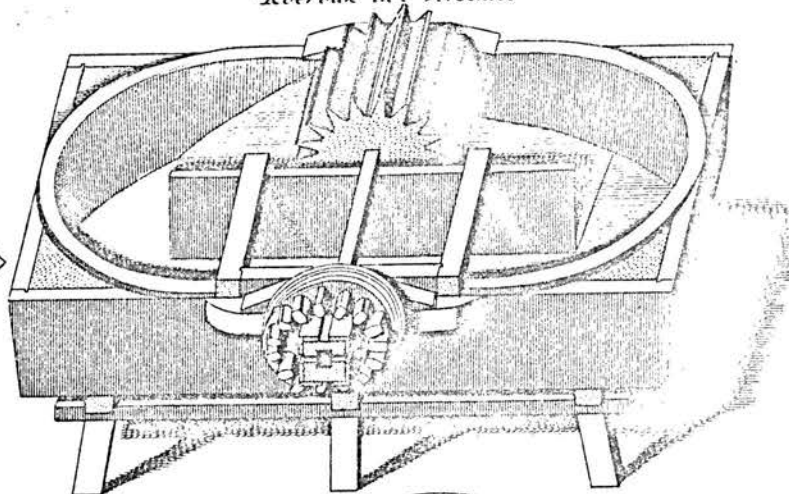


The hollander beater or grinding-trough, also from the 1734 book. Perhaps the most famous print of old-time papermaking. These drawings show the stirring-trough, the beater, the "full trough," and other views of the engine. Also shown are detailed closeups of the washing sieve or screen, of the baffle or tap board, and of the roll with its knives and a separate bar.

Fig. 4.



Roerbak in t verschieft



Het Wielje tot de Roerbak

the French influence on Scottish paper making was stronger than the Dutch for in France the Hollander did not make a quick success as the early models did not produce as fine a pulp as the stampers. For whatever reason, or combination of reasons, the Hollander does not seem to have made its appearance in Britain till about 1750. It was reported in the Universal Magazine (London) in June 1752¹ and mentioned in discussions at the Royal Society of Arts.² Unfortunately no mention of its introduction into Scotland has been found yet. It was, however, certainly in use in 1789 for an inventory of that date lists an item "One engin and roler and workin plant".³ The significant part of this entry is the "roler", as it identifies positively the "engine" to have been a Hollander engine.

In general construction (See fig. 4) this machine consisted of an oblong vessel about 10 ft. long, 4 ft. 6 ins. broad and 2 ft. 6 ins. deep usually made of wood and subsequently of iron. If made of wood it was lined with lead (of about 9 lb. per square foot). The trough was divided longitudinally but not quite centrally, the division being about 26 in. from one side and 22 in. from the other. Across the wider side was fitted, horizontally, a heavy roller. Originally this was probably of stone but usually of wood (elm) and about 22 in. diameter. Round the circumference

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1. The Universal Magazine (Lond) Vol. X (Supplement) June 1752 p. 325.
 2. R.S.A. Guard Books. Vol. III pp. 43, 50, quoted by Coleman, British Paper Industry. p. 110.
 3. Herbertshire documents, First inventory - James Liddel.

of the roller, parallel to the axis, were fitted steel bars or plates $\frac{1}{8}$ in. or $\frac{1}{16}$ in. thick projecting 2 ins. beyond the roller surface. Below the roller, on the floor of the trough, was a plate composed of bars similar to those on the roller but close together and extending about 5 ins. from front to back. This plate was moveable in a groove and the roller was adjustable for height above the plate. The general action can be pictured as similar to that of a rather blunt lawn mower since masceration and not cutting was required. The roller protruded above the trough and this part of the engine was covered with a semi-cylindrical cover. When charged with 112 - 130 lb. rags and filled up with water the roller was set rotating at 160 - 180 r.p.m. The rags were forced through below the roller and then round the narrower side of the trough to the input to the roller and so on. The finished pulp was fed out through a pipe to the stuff chest and the vat. It should be added that the machine could be used as a washer by raising the roller just clear of the bar and flushing through a supply of water at the rate of up to a hogshead per minute. The power required by an "engine" was about 4 h.p. and the output about 6 cwt. in a day - or about twelve times the amount from twenty mortar of hammer type rag masceraters. This fact is the key to the importance of the Hollander in the paper industry. For a fuller description of the machine and its action see the Edinburgh Encyclopaedia.¹ Confirmation of the sizes, by details of an actual

1. Edinburgh Encyclopaedia Vol. XVI p. 281 - also fig.

installation, including lead lining and elm for the roller, comes from a letter book of 1805.¹ Further confirmation of lead lining comes from another mill together with an interesting overall price " - one new Engine with Roller bars £55" - this was in 1795 or 1795.² It is interesting to note that the Hollander beaters and washers of the present day, though larger and of iron, operate in exactly the same way as the 18th century ones just described. In view of this long continued use, in the presence of intensive research and development in all branches of paper making, it is not surprising that its introduction in the 18th century made such an impact on the industry. As will be emphasised below when considering the introduction of the Fourdrinier machine, the beater, by determining the pulp output of the mill, controlled absolutely the output of paper.

Treatment and processing of the Pulp

a. The Stuff Chest

From the beater the stuff was passed through lead pipes to the stuff chest, a large storage or header tank from which the vats were supplied. This was made of wood or stone, and, if of wood, was lead lined with a somewhat lighter lead - about 7 lb. to the square foot. The size was said to be about 300 cu. ft. or three enginefulls³ and a specific

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1. Esk Mills letter book, letter to Andrew Mackenzie, London, 25 April 1805 for wood, to Laing & Miller, Edinburgh, 12th Feb. 1806 re lead lining for two engines and two stuff chests.
 2. Herbertshire Documents "Additions made by Strachan Laing & Co. item 10."
 3. Edinburgh Encyclopaedia Vol. XVI p. 282.

instance of two such chests made in 1806 gives the capacity of each as just under 240 cu. ft.¹ Round chests were often preferred, and in small mills may well have been cut down from casks. The main reason for the preference, however, was that they enabled agitators to be used to prevent the pulp and water from separating out without producing "dead spots" in the chest. In early times the agitation was done manually with a paddle. According to Dard Hunter, it is unlikely that mechanical agitators were in use by 1800, and the first published account of their use was 1803.² This occurred in a description by a French papermaker of a visit to Matthias Koop's enormous paper mill in London.³ Though no Scottish patent has been found for this idea, evidence for its use in Scotland by William Simpson at Polton in October 1795 occurs in the Gilpin Journals.⁴ He writes of " - the hog or trundle made to turn in the Stuff Chest to keep the stuff constantly up ... " and illustrates with a sketch. This pre-dates the account of its London use by eight years and though it is not contended that the idea necessarily originated in Scotland, it seems that the earliest account of its use applied to Scotland. A further example

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1. Esk Mills letter book, letter to Laing & Miller, Edinburgh, 12 Feb. 1806.
 2. Hunter Dard. Paper making p. 176 footnote.
 3. This mill, which is said to have cost £100,000 to erect, was the first commercially to produce paper made not from rags, but from straw, wood and other materials. Koops became bankrupt at the end of 1802.
 4. Gilpin Joshua. Journal Vol. IV. See Appendix. p.308.



Fig. 5

has also been noted at Herbertshire in 1795-1796,¹ indicating a wider use than has yet been recognised.

b. The Vat

The vat, to which the stuff was piped from the stuff-chest, was in effect a smaller version of this - of the order of 5 ft. square by 4 ft. deep. Here again they were often circular and sometimes with a flat side at which the vatman stood.² The capacity was about 100 cu. ft. or one enginefull. It was early found that quite apart from the comfort or otherwise of the vatman, who had constantly to be dipping into the stuff, a great improvement in the quality of the paper resulted from warming the stuff. A small stove or brazier was situated within or under the vat, a method which lasted till near the end of the 18th century. Apart from the fire hazard there was always the likelihood of dust or coal getting into the pulp or on to the paper so it is not surprising that steam should have been used when this became available. The first U. K. patent for steam vat-heating was by William Scott, Plumber, and George Gregory, tin-plate worker, both of Edinburgh, in August 1793.³ The patent illustrates the heating of three vats and a stuff-chest. That his idea was in use by October 1795 is confirmed from Gilpin's Journal again,

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1. Herbertshire Documents, Inventory 3, Strachan Laing, item 11, One Hogg for Vat ... £5."
 2. See Scott & Gregory's patent drawings. S.R.O. Chancery Specifications of patents and drawings,
 3. S.R.O. Chancery specifications of patents and drawings Box 2. 1790-1793.

WILLIE FIELD
1815

Fig. 6.

ROBERT WIELO
CARBON MICHIG
1829

Fig. 7.

where he describes and illustrates this "the first improvement he noted" at Simpson's Mill¹ at Polton. The pulp having been made and delivered into the vat, the highly skilled operation of the Vatman was next. This was the actual forming, if not making, of the sheet of paper, or waterleaf as it was known in its wet state. For this purpose the Vatman used a mould or frame,

The Moulds

The moulds were the pieces of apparatus in which the paper was formed, both as regards size and thickness. Constructed of mahogany, they always came in identical pairs with a single deckel or detachable rim which made the mould into a kind of shallow tray. The base was originally of the "laid" type. In this mould wooden cross bars were fixed into the frame and across these were run wires (along the length of the mould) at a spacing of from 15 to 20 to the inch. These are known as the "laid" wires and they were individually attached to each cross bar. (Fig. 5 ... shows the wire detail of this type). A feature of the paper made in these moulds was a thickening of the chain lines (corresponding to the wooden cross bars). In the development of the art of paper making this undesirable feature was overcome by fitting a stout wire (about No. 9 S.W.G.) along each cross bar and fixing the laid wires to these cross wires instead of to the wooden bars. Figs. 6 & 7 are photographs of paper made from these two types of mould.

1. Gilpin Joshua. Journal Vol. IV. See Appendix. p. 307.

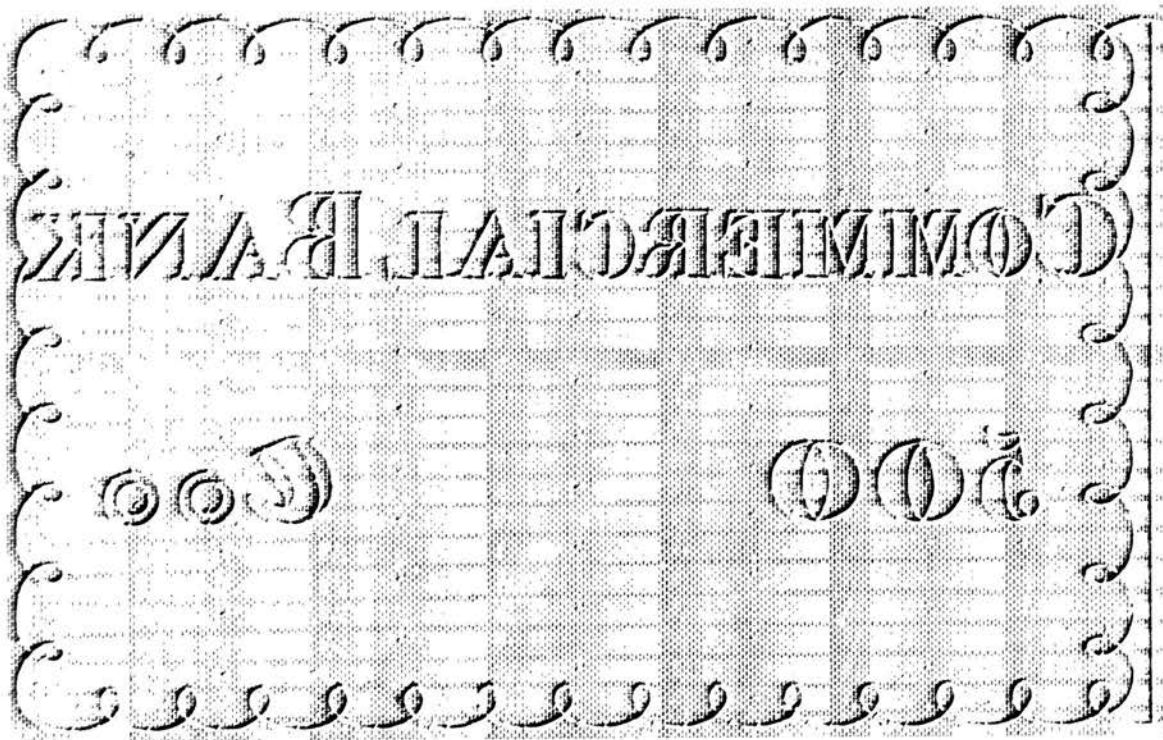


Fig. 8.

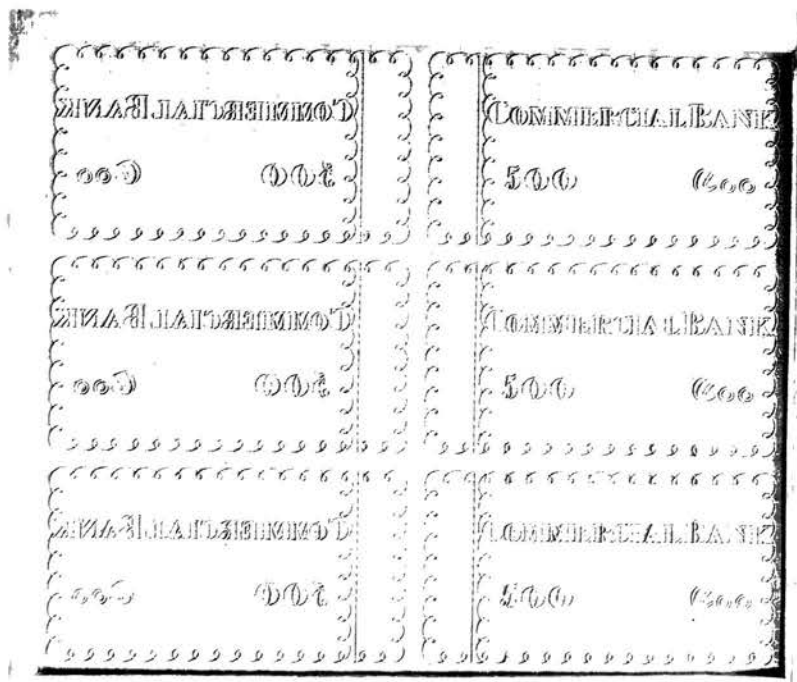


Fig. 9.

The next advance in mould-making was the introduction of the "wove" type. (Fig. 8) In this a woven wire cloth fabric was substituted for the laid wire structure. The paper produced from such moulds showed, of course, no laid or chain lines, but had a surface resembling woven silk and with an even translucence. This development had far-reaching consequences, for it led to the establishment of wire weaving as a craft. When the time came to supply the Fourdrinier machines with their endless belts of woven wire, the industry was able to cope with the demand, because of the experience gained in this part of the hand-made industry.

Returning to the moulds themselves, it should be mentioned that the watermark was formed by wire stitched on to the wire base and forming the letters or device desired. As the device or lettering was on top of the wire base, it made a slight thinness in the paper and so the "watermark" was visible when viewed against the light. (Fig. 9). Such watermarks were early used for security by the Bank of Scotland on its notes.¹ In construction, the moulds had a peculiar and special joint at the corners, since, due to their so frequent immersion in the warm stuff, glue could not be relied upon to hold the joints. Usually, too, there was a brass reinforcement because of the strain to which they were subjected.² Not only did the weight of the pulp lifted constitute a

1. Waterston R. B.O.E.C. XXVII p.47 and Royal Bank of Scotland Changes of Management book 1727.

2. Noted by Gilpin at Polton "The molds are guarded with brass."

load on the mould, but the Vatman gave the whole a peculiar movement forwards and backwards and sideways. This was known as the "shake" and was given to produce a measure of interlocking of the fibres in both directions. The sudden loss of ability to make the shake was an occupational hazard of Vatmen and for this reason they sometimes changed jobs with the coucher for a spell. It may be noted that the skill required by the vatman was of no mean order for he had consistently and repeatedly to take up the right quantity of pulp in the mould - he had moreover to maintain a careful balance to prevent a thickening of the sheet at one end, as the liquid drained through the bottom of the mould.

In the Scottish paper industry references to moulds in general and in detail occur from the 17th century¹ showing that the practice was

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1. 1696 Nicolas Dupin claimed to have "arrived at the art of making all sorts of fine paper moulds ... at a far cheaper rate ..."
Chambers. Annals of Scotland Vol. III p. 86.
 - 1727 "To one pair new frames £1:15:-" Royal Bank of Scotland
Charges of Management book.
To making a box for the frames and sewing on the letters 5/-.
 - 1758 To the person who shall make the best pair of moulds of brass
wire for making paper, two guineas. Awarded to Walter Moodie
nr. Pennycuik. Advt. of the Edinburgh Society for the
Encouragement of the Arts, Sciences and Manufacture in the Scots
Magazine April 1758 and April 1759.
 - 1796 One pair Crown moulds, £1. One pair Double Grey moulds
£1:10. pr. small Brown, 1 pr. Large Brown.. Inventories,
Herbertshire Documents.

not necessarily different from that of England or Europe. The earliest price for moulds (or frames as they were also known) occurs in an entry in 1727. Made for the Royal Bank of Scotland the pair was priced at £1:15:0.¹ This figure seems quite reasonable compared with later prices which show the moulds to have been relatively expensive pieces of equipment. In 1820 moulds were bought for £3:3:0 and for £6.² Unfortunately no sizes or details are given but, as they always came in pairs it is perhaps fair to assume the lower figure is for one pair, since the second-hand valuation at Herbertshire a few years earlier was £1:10:0 for Double Grey and £1 for Crown.³ From a contemporary (1811) price list for joinery work,⁴ the price for a half-round dining table four feet long and two feet wide would have been 12/9d. while a library writing table of similar size, with three drawers, was 18/9d. Allowing that these were "works cost" and not retail prices, it still shows the relatively high cost of moulds of which a small mill would require probably a minimum of four pairs.

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1. In 1793-1794 Nisbet & McNiven estimated £15 for moulds in their 6 vat mill. These would of course be replacements and no number is given. O.S.P. 206.8.
 2. 1820 Paid Mr. Brown for moulds £6 and 1821, Pd. Archd. Wilson moulds £3:3. Esk Mills Cash Book. In 1793-1794 Nisbet and McNiven (etc.) See "1".
 3. Herbertshire Documents. Inventory.
 4. The London Cabinetmakers' Union Book of prices. London 1811. pp. 205 & 87.

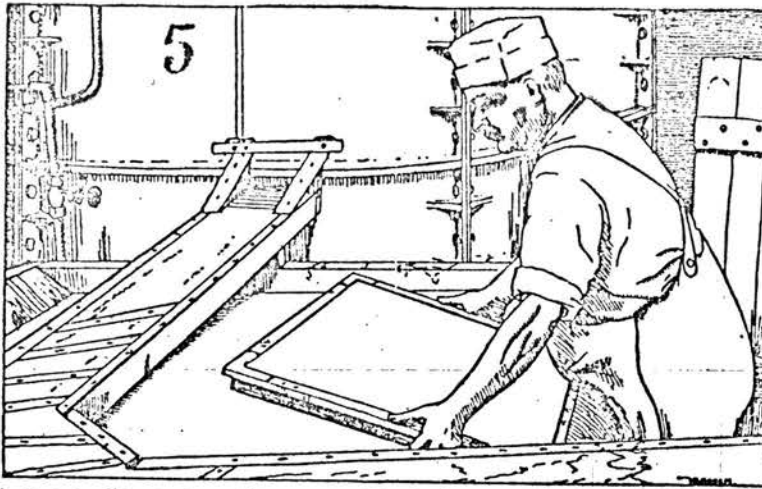


Fig. 48.—VATMAN AT WORK.

PAPER MAKING.

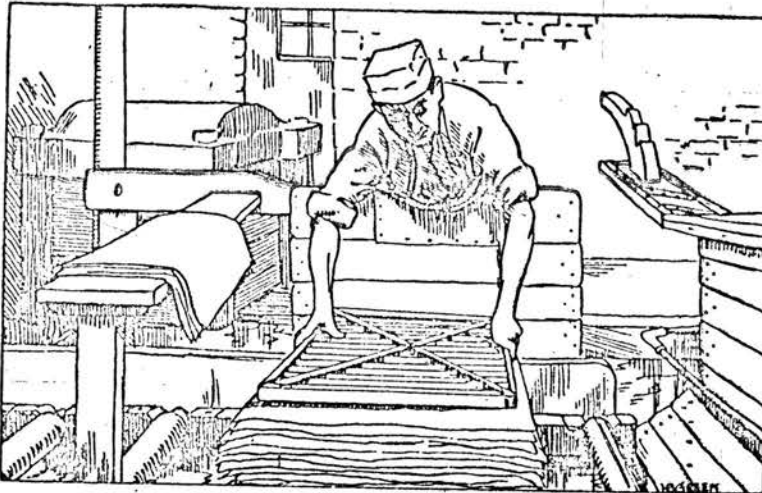


Fig. 49.—COUCHER AT WORK.

PAPER MAKING.

Fig. 10.

Treatment of the Waterleaf and paper

a. The Felts

The word "felt" by which these pieces of material were known is really a misnomer for they were made of coarse woven cloth and were not felted. The old name "hair cloth" was perhaps better. It was on to the felts that the waterleaf was "couched" that is, turned off the moulds while still wet. (Fig 10). They were consequently made a few inches longer and broader than the sheet of paper for which they were to be used.

Considerable care had to be taken in their manufacture as any blemish or irregularity in the weaving would mark the paper. After fulling and shrinking, a nap was raised on what would subsequently be the lower side. A careful brushing to remove any loose fibres brought up by the raising, completed the work and the felt was ready for use.

Though the references to felts in the Scottish paper industry are not numerous, they occur from very early times¹ and their cost was fairly high. In an inventory of 1714, fifty-two Hair Cloths were valued at £7:4:0 (Scots) or a fraction under threepence each (sterling).²

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1. In 1683 Alexander Daes, papermaker of Dalry, complained that James Lithgow, paper maker at Upper Spylaw, Colinton, "... had ... abstracted (stolen) hair cloths." R.P.C.S. Ser. III Vol. VII p.338.
 2. S.R.O. Edinburgh Commissariat. 23 Nov. 1714. Peter Spence.

The size of these is not given, but the cost is of the same order as some valued just over eighty years later. In this case, eight quires of Crown felts (15 x 20) were valued at £2:8:0¹ or just over threepence halfpenny each.

In operation the quantity of felts required was at least enough to form two posts of each size. The post was 6 to 8 quires and if four sizes were to be available, this would entail an expenditure of some £20.²

b. The Presses

The presses were operated by the press men or, in the days before the screw press was general, by Leveers, i.e. operators of the press levers. As will have been gathered from the brief description of the process, there were wet, or vat presses and dry, sizing and finishing presses. The first of these were used to expel the water from the newly-formed sheets or waterleaf, stacked to the height of 6-8 quires and known as a post. The second type was used to expel excess size and to give finish to the sheets. Anonymous supplies are listed at Herbertshire, which from the nature of the installation and the correspondence connected therewith, are likely to have been locally supplied, probably by the Carron Works. The prices here for new presses, fully mounted, were £40 each and £25 for a size-house press.³ An earlier installation at

1. Herbertshire documents. Inventory.

2. Esk Mills documents, letter book 14 June 1808 gives an entry "... I have ordered Demy felting (15 x 20) at 3/-." The quantity is not indicated but may have been for a dozen.

3. Herbertshire documents. Inventory 1795, Machinery added. Item 5 Four new presses fully mounted £160. Item 6 One press in Sizehouse £25.

Herbertshire, in 1789, was certainly supplied by William Cadell & Co., of Carronpark, (which was also on the Herbertshire estate). This was, 1 paper mill screw, Box and extra work, mounts, £13:7:0¹ and it establishes that at least the screw part of a press was obtainable in Scotland at that time.

At Esk Mills, presses were bought from John Hall, Dartford.² The price was estimated in April 1805 to be between £170 and £200 for five wet- and six dry-presses. In the event, when the order was eventually completed, rather more than two years later, there were five wet and seven dry presses delivered. The price paid was £224:14:0³ which is considerably less than the Herbertshire price of some ten years earlier. Approximate prices would seem to have been £25 for the wet press and £15 for the dry. In a small installation one might expect an expenditure on presses of £15 - £20.

A somewhat more detailed account of the work of the Vatman, the Coucher and the Layer, published in 1823,⁴ will bring their work into relationship with the moulds, the felts and the presses.

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1. Ibid. receipt dated 16th June, 1789.
 2. John Hall (1764-1836) founded his firm in 1785. Bryan Donkin and James Bertram and his brother were all apprentices of Hall of Dartford.
 3. Esk Mills letter book 23 April, 1805, 22nd June, 1805, and 3rd Sept., 1807.
 4. Edinburgh Encyclopaedia Vol. XVI p. 282. The only four copies of this work noted are all dated 1830 on the title page but the colophon on two of them gives 1823. The article seems to have been written by Sir David Brewster but he was probably "advised" for he did not write the article on Bleaching.

"There are always a pair of moulds laid on the bridge, and the workman putting on the deckel, brings the mould to a vertical position, dips it about halfway up in the stuff before him, and bringing it to a horizontal position, covers the mould with the stuff, and shakes it gently. This operation is extremely difficult, for if the mould be not held perfectly level one part of the sheet will be thicker than another ... he then pushes it along the small board to the left, and takes off the deckel; here the coucher receives it, and places it resting on the ass,¹ so as to get quit of some of the water; the vatman puts the deckel on the other mould, and makes another sheet. The coucher stands to the left side of the vat, his face towards the maker; on his right is a press in which the felts are; the felts are porous pieces of flannel; a plank three inches thick is before him on the ground; on this he lays a cushion of felts, and on this another felt; he then turns the mould and presses it on the felt, where the sheet remains, he returns the mould, and pushes it along the bridge; by this time the maker has another sheet ready, which he places on the ass, lays down another felt, and couches the sheet upon it.

They go on in this way, felts and paper alternately, till they have a heap of six or eight quires, which is about 15 or 18 inches high. Then they draw it into the press, where a pressure of from 70 to 100 tons is applied, either by a lever or machinery. When it is sufficiently pressed,

1. The ass was a small wooden frame against which the mould could be rested at an angle, to assist drainage.

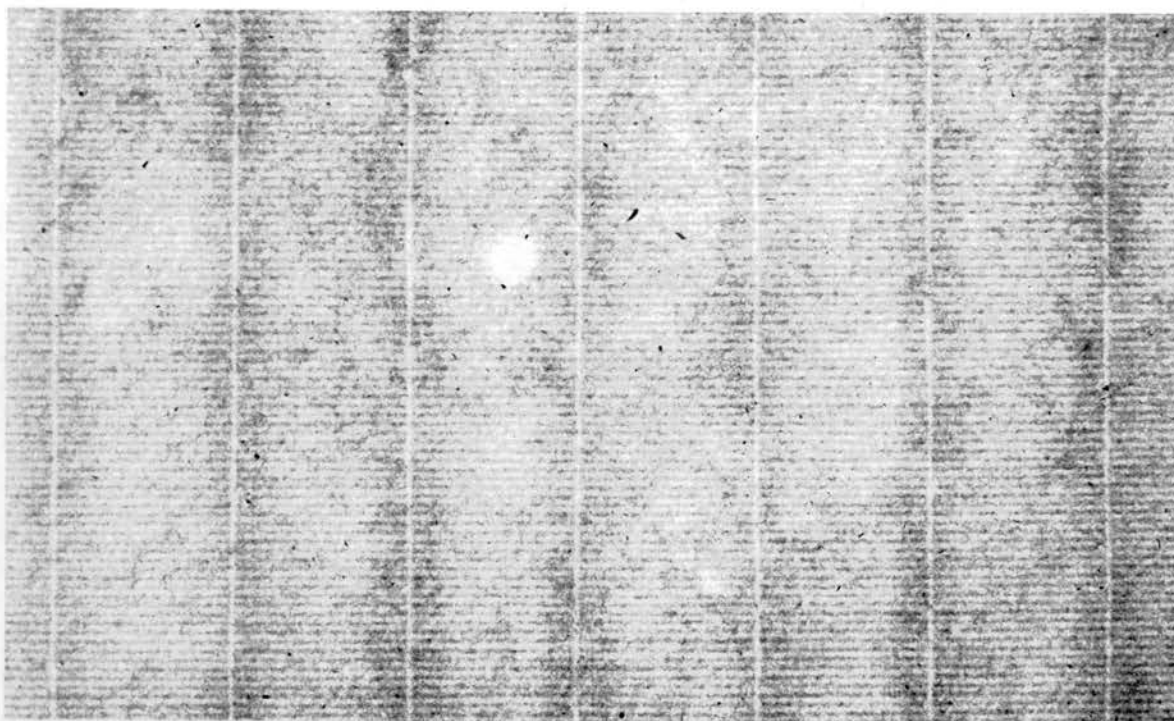


Fig. 11.

they strike off the check, and, from the elasticity of the flannel, the screw flies up with great rapidity. The felts are then drawn out on the other side, where a layer stands; a board is put horizontally in the press, on which the layer places the felt; he lifts up the sheet, which has now considerable strength, and places it on another board to the other side; places on the board another felt, whence the coucher takes them, and anew puts paper on them. Two men at the vat, and a boy laying, make about six or eight reams in ten hours. In the evening, the whole is put into another press, and a moderate pressure exerted; this is to get quit of the mark of the felt and of part of the water. Next day it is all separated, which is called parting, and being again pressed, is carried into the loft. Fine papers are often twice parted and pressed, in order to give them a good surface."

It should be added that if at any point in the above procedure, e.g., the removal of the deckel or when moving the mould, any drop of water from the vatman's finger or elsewhere, is allowed to fall on the embryo sheets then a circular 'blob' or thin water-mark will be formed on the sheet. Fig. 11 shows an example of this. As the Vatman was continually dipping into the vat, it can be seen that his job called for considerable skill and even finesse. It seems possible that the blob water mark may have been the origin of the term "watermark" since both are visible due to a thinness of the sheet at the affected place.

c. The drying.

This process was carried out in lofts, that is at least at first floor level. In the loft were vertical pillars about 10 or 12 ft. high with small holes drilled at 6 inch pitch from about 5 ft. and upwards. Cross bars were pegged out to the posts and between the cross bars were strung the cow-hair drying ropes. Many of these cross bars or trebles were pegged on to the posts and the paper in groups of three or four sheets hung on the rope to dry.¹

Several references to hair drying rope and trebles have been found² but perhaps the main point of interest is the enormous quantities of such rope that were required. From the Esk Mills correspondence book³ we find the proprietor ordering two tons of the rope and the price he paid was about 42/- per cwt. so that he was prepared to lay out over £80 on the rope. From measurements on the specimen of hair drying rope in the Royal Scottish Museum there are approximately 7 ft. to the 1 lb. thus the Esk Mills order for 2 tons would be for 31,360 ft. or just on 6 miles. This was for an extension involving two vats. The very large quantity has been confirmed from Hayle Mill (Maidstone) one of the few remaining hand-made paper mills still in operation.⁴ It may be reckoned

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1. For a more detailed account of the trebles, see Edinburgh Encyclopaedia, Vol. XVI, p. 282.
 2. Herbertshire Documents. Inventory 1785. Item 5 Five rooms with six trebles of ropes in the new loft, item 6. Sixteen trebles of ropes in the old loft. item 17 two small tables on which they stand in order to hang up the paper.
 3. Esk Mills Letter Book 26 April, 1805, 10 May 1805, 28 June 1805, 6 Feb. '06, etc.
 4. In a letter to the writer, J. Barcham Green writes "when we were working 5 vats 6 days a week we had 6 lofts, each loft divided into 2, 3 or 4 rooms and having a total of 32 rooms. There were 10 trebles to a room and 22 lines to a treble; each line was about 12 ft. long. This gives a length of 84,480 ft. or 16 miles." If this is reduced in the ratio 5:2 (for Esk Mills) we get 33,792 ft. or 6.4 miles which is in quite close agreement with the figure obtained above.



Fig. 12.



Fig. 13.

then that apart from any building or heating, a small one vat mill would require up to £50 expended on drying rope.

The sides of drying rooms were fitted with louvres or sliding panels (see figs. 12 & 13) and in fine weather the paper could be dried in as little as one day but in damp and wet weather this was greatly exceeded. To overcome this difficulty, stoves and steam pipes were introduced. As far as can be found, the first recorded instance of such auxiliary heating in Scotland was in 1787 at Sauchie (Stirlingshire). In a Sun fire insurance policy² a mention is made of "Drying house Stove." After 1795 the policies almost invariably mention such a stove or specify its absence.³ Joshua Gilpin mentions the carrying of a flue round the drying room as one of the four "improvements" he, a paper maker himself, saw in Simpson's Mill at Polton in October 1795.⁴ From these it seems likely that the Sauchie installation was a particularly early one and that from about 1795 the idea was becoming more general. The cost of such an installation might be put at £30, since a copper boiler was priced at £60 - £63 in 1806,⁵ and normally iron would be used for this purpose. Thus for the whole drying apparatus rather more than £80 might be required.

1. Edinburgh Encyclopaedia Vol. XVI. p. 282.

2. S. F. I. P. January 1787 James & Robert Liddle Milnholm of Sauchie.

3. S. F. I. P. 636475, no stove therein 1795. 681673, a stovehouse communicating 1798. 705288, no kiln or steam engine therein 1800.

4. Gilpin Joshua, Journals Vol. IV and diagram. See Appendix p.310.

5. Esk Mills letter book 16 January, 1806, to Henry Armstrong, Edinburgh.

Sizing

The need for sizing arises from the use of fluid inks for pen writing as distinct from the thicker brush-writing inks used in China, where paper originated. The need on many printing papers is for less sizing while wrapping papers and "whited brown" were not sized at all. During most of the hand-made period in Scotland, whited brown and other wrapping or lapping papers constituted about half the national output so the process to be described was not in universal use: many small mills would do no sizing and others only a little.

In the hand-made era the only method was tub-sizing, in animal size or glue. Towards the end of the period, in 1807, Moritz Friedrich Illig published his pamphlet on his experiments on Rosin sizing,¹ carried out about seven years previously. This consisted of mixing the size with the pulp and so eliminating any separate process. The idea was not quickly adopted but with the development of machine-made paper it eventually became general.

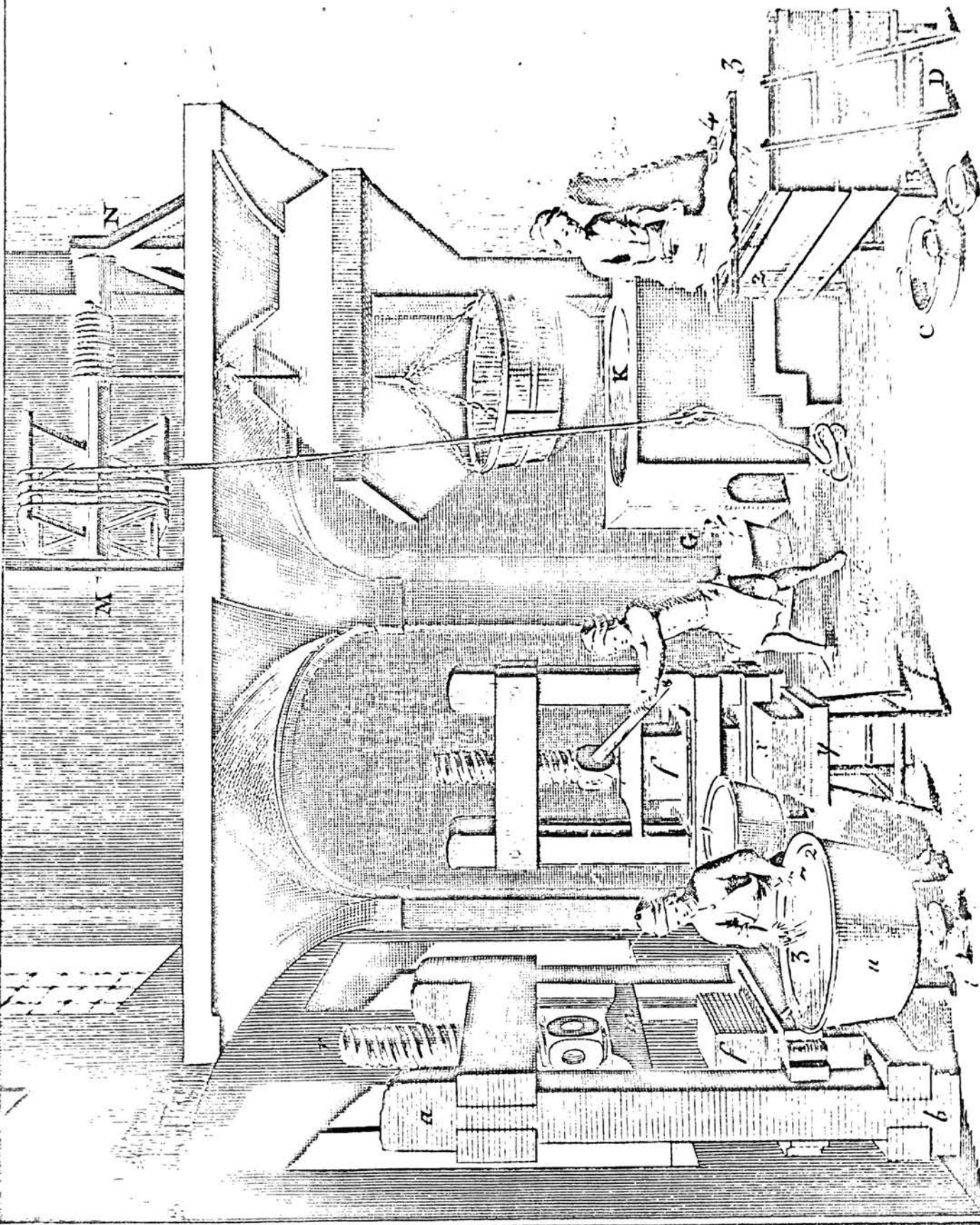
The first part of tub-sizing was the preparation of the size. This consisted of a glue prepared from animal skin pieces, hoofs, ears and feet obtained from wherever possible and of course subsequently from slaughterhouses. Not all animals were considered suitable, sheep being

1. Anleitung auf eine sichere, einfache und wohlfeile Art Papier in der Masse zu leimen Als Beitrag zur Papiermacher Kunst. Quoted by Renker A. Moritz Friedrich Illig. The Paper Maker Vol. 30. no. 2.

thought best where possible.¹ The animal pieces were boiled in water which was frequently skimmed after which the liquor was strained several times to remove all possible particles. It was then allowed to stand to clarify. The final glue or size was fairly clear and pale and was diluted with water for use in the tub. The smell arising from the boiling of the assorted animal scraps must have been very potent and, understandably, it was quite common to have the sizing house separate from the other buildings. The earliest specific reference to this practice was in 1792 when William Simpson insured his mill and an item in the policy is "Sizing house only, near ..." Similar references occur at other mills.²

The process of sizing was not an easy one, for when it was made, the size itself was much affected by the prevailing weather. When conditions were warm and dry, the size lost moisture to the atmosphere and so became more concentrated. Conversely, when the weather was damp or humid, moisture was absorbed by the size, with a consequent weakening of the

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1. Voorn Henk. A brief history of the sizing of paper. The Paper Maker Vol. 30 No. 1, 1961. In this article the author says, "... sheep and goats were preferred, cows and calves giving a strong but not very clear size, whilst pigs and horses were totally unfit for the purpose".
 2. Sun Fire Insurance Policy No. 609376, 24 Nov. 1792. Other instances were the Broomhouse Paper Mill Co. in 1802 where the size house and drying lofts were together. S.F.I.P. 737137 Sept. 1802 and William Cadell & Co. who built a new sizing house at their mill at Auchendinny. S.F.I.P. 742123 6 June 1803.



Diderot.

Fig. 14.

mixture. To offset this, alum was added and, acting as a protein coagulant, rendered the gelatin in the size, insoluble. The date of the origin of this practice is not known, but the writer of a recent article gives the time as early as the latter part of the 17th century.¹ An unfortunate side effect was the production of dilute sulphuric acid in the solution, a probable cause of deterioration and decay of the paper fabric.² Though the acid was in very weak solution its effect over a very long period was ultimately noticeable.

The operation of sizing itself was a highly skilled one, for in addition to the weather hazards already mentioned, the different types of paper required different treatment. The general practice was to immerse a swatch of sheets in the warm size. The operation involved "leafing" the sheets to avoid dry pockets or voids and the swatch was held by the sizer between two pieces of wood. (See fig. 14). After sizing, the paper was pressed to ensure even distribution of the size and to expel the excess. After the pressing, the paper was again dried on the ropes, in small bundles or "spurs" of 5 or 6 sheets. The detailed temperature arrangements, spur sizes and the steam heating and shutter operating schedules quoted in an account of modern tub-sizing of hand-made paper, serve to underline the difficulties experienced in the 18th and early 19th centuries.³

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1. The slow fire consuming our books. Hercules Chemist No. 16 Feb. 1963.
 2. Barrow W. J. Deterioration of Book Stock, Causes & Remedies. 1959. Virginia State Library. Richmond. Va.
 3. Green J. B. One hundred and fifty years of paper making by hand, p. 17, 1960.

The cost of the sizehouse apparatus would not be very great, consisting as it did of a boiler, with suitable strainer, tub and a press - perhaps £25 would cover these items.

Glazing, Hot-pressing, etc.

After drying, the sized paper was taken to the Salle for any glazing needed and for picking and packing. A pair of glazing rolls is shown in La Lande's "Art de faire le papier" published in 1761 though the idea of glazing with a hammer is much older than that.¹ An interesting, if enigmatic, mention of "Paper Glaize" occurs in an inventory of 1714.² However, that Scotland was not unduly slow in adopting such ideas is shown by the mill at Tongland. Advertised for sale in 1772³ it specifies "... and complete glazemill ...". The mill itself was probably started in 1767⁴ and if noteworthy in the advertisement, the glazemill may well have been of fairly recent origin - say 1770. Unfortunately no receipts have been found to assess costs but some £20 would probably be reasonable.

Dard Hunter gives the date of the introduction of hot pressing, as 1809 in America, but gives no date for England. References in a wages book of 1806⁵ show that Cowans were hot-pressing in that year. This again shows the

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- 1, A short history of glazing. The Papermaker. Vol. 27, no. 1.
 2. S.R.O. Edinburgh Commissariat 23 Nov. 1714. Peter Spence, inventory "... in the mill at Yester, ... Paper Glaize £3 (Scots)".
 3. Newcastle Journal 30 May, 1772.
 4. An entry in the excise accounts for the Dumfries Collection in this year (1767) indicates the start of a mill in the area.
 5. Cowan documents. Wages book C 1806 entry "Anne Cowan hot pressing 5/3, Margaret Murphy hot pressing 5/- and Isabella Murphy hot pressing 5/3."

Scottish industry to have been alive to the improvements and inventions of the day if not itself contributing very greatly. From the description of hot pressing in the Edinburgh Encyclopaedia¹ the apparatus was simple and would not have cost more than about £5 or £10 at the most.

The final process, performed in the Salle, was picking and packing. Generally done by women using small knives to pick out the knots, they also separated the good from the bad. A good finisher was said to have been able to count about 200 reams or 96,000 sheets in a day of 10 hours.²

From the above costs of the various pieces of apparatus and machinery an estimate will now be made of the expenditure necessary to equip a one vat mill. It is not suggested that any particular mill would necessarily contain all the items listed. The table simply gives an idea of the outlay required for the various sections of a mill in the hand-made era. As noted above, if the mill concentrated on Brown or Whited Brown paper it would not need sizing equipment. Correspondingly, larger concerns would require extra vats, engines, bleaching house apparatus, presses and drying facilities. The prices quoted were derived from a variety of sources and their varied origin, both as regards time and place, ensures that the estimates are of the right order for the period under review.

1. Edinburgh Encyclopaedia Vol. XVI p. 283.

2. Ibid.

Estimate of cost of very fully equipping a One Vat Mill c.1800,

(a) For the dry treatment of the rags

Tables with boxes, wire grates, etc.	£ 6
Rag duster wheel	say 10

(b) For bleaching the rags

Apparatus of the bleaching, with furnace	30
Vats and chests in bleaching house	10 to 15

(c) Reduction of rags to pulp

No information available on cost of mortar	
Hollander type beater, supplied complete	50

(d) Treatment of pulp

Stuff chest with hogg	10
Vatt with hog	10
Boiler and heater for vatt with pipes	40
Moulds - four pairs	15

(e) Treatment of waterleaf and paper

Felts - four sizes, eight quires each	25
Presses - one wet and two dry	55
Drying rope - say 1 ton, about 3 miles	40
Heating pipes for drying loft (no boiler)	10
Size tub, skin boiler	15
Glaze rolls	15
Hot pressing apparatus	5

£346

This gross figure agrees quite well with the sums covered by insurance on machinery and utensils (i.e. without stock) as dealt with in chapter four.

From the evidence of the present chapter, it can be concluded that in the hand-made period the Scottish paper industry was enterprising in adopting new ideas and that it pioneered many inventions and developments. This applies particularly to the use of steam for heating the vats, the size tubs and the drying rooms. The introduction of the hog, too, was a very early development and may well have been independent of similar developments elsewhere. The hot press was adopted very soon after its invention. The adoption and development of chlorine for bleaching rags was the most important and far-reaching improvement by the Scottish paper industry. This was not merely a matter of the purchase of some chemical additive and some extra vessels, it meant the manufacture at the mill of the chlorine itself. The apparatus had to be built there too and Joshua Gilpin gives considerable detail (with sketches) of the lead retorts supplied to Wm. Simpson by Wm. Scott, an Edinburgh plumber. He visited this man (in Shakespeare Square) and he was almost certainly the co-patentee with George Gregory, of the vat-heating scheme already mentioned.¹ That such a plumber should have existed, skilled in more than "domestic" lead work, may well have resulted from Scotland's eminent position in the world of science and perhaps particularly of

1. In the Edinburgh directories from 1773-1803 there is continuously one, and only one, William Scott, Plumber.

chemical science. There were many examples such as the production of sal ammoniac by Hutton & Davie from ammonia derived from the Culross tar distillery, the soda obtained from kelp burning, as well as Charles Tennant's bleach solution and chloride of lime production at the St. Rollox chemical works. Much of this activity derived from Joseph Black, Professor of Chemistry and Medicine at Edinburgh from 1766-1795, a pupil of Wm. Cullen who held the chair from 1755 and whom he succeeded. Black pioneered much in chemistry, he used and designed in the locally available bottle glass, retorts and vessels hitherto unknown.¹ The vast Prestonpans sulphuric acid plant owed much to the burgeoning of chemistry under Black.² The translation of Berthollet's work by Kerr, published in Edinburgh by William Creech, and running to at least two editions, shows, too, the atmosphere of the times: times which produced in addition such men as Sir John Leslie who made his "Inquiry into heat", and James Watt who, as well as analysing water, added the condenser and made Newcomen's engine so much more than a pump.

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1. R. S. M. A large quantity of Black's apparatus is in the science collection.
 2. Vincenzo Lunardi's flight in a hydrogen balloon from Edinburgh to Ceres (Fife) on 5th October 1785 also indicated the development in chemical science. Large lead vessels were ordered, and 2,000 lb. of iron filings, 2,000 lb. of sulphuric acid as well as 1,200 gallons of water were used in the grounds of Heriot's School to produce the hydrogen to fill the thirty-three foot diameter balloon.

If Watt's engines did not immediately revolutionise the paper industry it is surely because that industry was well-established. For the most part it was established on good water sites and was satisfactorily drawing its power from water. Then although steam itself was being used increasingly for heating processes, the beater was the only piece of apparatus in a paper mill capable of being driven by a steam engine. Although much has been written about the vagaries of water power it seems likely that these were not as universally bad as one might suppose.. The fact that mills recently and even up to the present day have used water power for driving their beaters shows a measure of reliability.¹ Another factor which may have favoured water power was the very steady "going" of that power source, compared with the early low-speed steam engines, whose torque, even with the large fly-wheels, was somewhat unsteady. The cost of the steam engine was considerable - a 32 h.p. engine was estimated by Boulton Watt and Co. in 1805 at £1,497 - and the fuel consumption was very heavy.² In the opinion of contemporary paper makers the overall cost of installing and running a steam engine and boilers outweighed the possible advantages in output and even of reliability. Not till 1803 was the first Watt engine installed in the Devanha mill at Craigbeg Ferryhill, Aberdeen,

1. Bleachfield Mill, Ayton, Berwickshire, was in operation up till 1942, driven by a water wheel. Woodside, Aberdeen, is still in 1965 operating for rag breaking driven by a 25 ft. water wheel.

2. Balston, Thomas. William Balston paper-maker London 1954 p. 40.

and this mill failed and was sold out in 1807.¹ The purchaser was Lewis Smith of the Peterculter mill and in the same year he obtained the license for the first paper-making machine in Scotland so that the steam engine can be considered to belong more definitely to the machine age. It was born in the hand-made era but its main influence was not in paper-making in that period.

In Scotland, then, it seems established that the paper-making processes followed the French and the English mode, and that the industry was quick to adopt new ideas. In the application of science by a somewhat conservative group of men, the paper-makers of Scotland were probably as assiduous as their more numerous and longer-established neighbours. Perhaps they were more so, since their share of the United Kingdom output of paper rose so markedly between about 1783 and 1795 from a little over two to nearly twelve per cent. of the total. The expansion of the industry and the use of the Excise records as source material are discussed in the next chapter.

1. Deeside Field 1933 p. 39 and Aberdeen Journal 25 Feb. 1807. A similar unhappy fate befell the enormous Matthias Koop's mill in London where John Rennie had installed steam engines in 1803.

CHAPTER THREE

The Excise

The first act to impose an excise tax on home-produced paper was passed in 1711.¹ In the ensuing 150 years twenty-six other acts were passed.² These modified, extended and changed the incidence, the amount and the method of excising paper. Many of these acts dealt also with other commodities such as soap, linen, candles and brewed liquids, so that the excise officers had to deal with a fair variety of goods. Though this might be represented as a weakness in the system, tending to unreliability of the records, it is hoped to show that this is not the case and that the excise records provide the best available source of material for gauging the growth of the paper industry in Scotland. The whole period of 150 years of the operation of the excise on paper may conveniently be divided into three sections, 1712-1780, 1781-1793 and 1794-1861. In the first of these the tax was imposed at a certain amount per ream for eleven specified types of paper. For papers which did not conform to the eleven specifications, a percentage of the declared market value was payable.³ This was a method of tax assessment long familiar to the Customs authorities. In the second period an attempt was made to assess the tax by reference to the physical description of all the papers on the market.

1. 10 Anne C.19.

2. See Appendix. pp.326-328.

3. 10 Anne C.19.

The number of specified types of paper was increased to 73 and non-conforming papers were charged at the next more expensive rate. For the third period the tax on all the paper was assessed by weight.

Excise Books at the Scottish Record Office have brought to light the quantities of paper charged to excise in Scotland. These cover the whole period during which this was administered from Edinburgh - from 1712-1832. The records are in greater detail than the previously published figures and in particular enable the period 1712-1736 to be supplied. This was previously listed as 'No distinct account can be furnished prior to 1737.'¹ The fact that there was such a long and continuous series of records tends in favour of reliability. The very diversity of materials, the change of inspectors and other officers from district to district and from collection to collection, and the regular audit combine to give the figures a degree of inherent internal accuracy and reliability. The five generations of excise officials concerned with paper were not isolated, but formed part of an ancient yet continuing service and it would seem that any gross unreliability in the records must imply either dishonesty or incompetence. The audit and high degree of arithmetical accuracy already mentioned, would seem to exclude dishonesty by individual officers. The lack of prosecutions and surcharges on officers² would seem to limit such dishonesty, where it occurred, to a degree which would not invalidate the records as a whole; unless it is suggested that the whole set-up of the Commissioners of Excise was corrupt. No such contemporary

1. PP 1857 (Sess. 1) 18 App. 22. b.

2. S.R.O. Enrolment books of Warrants. 1-12.

suggestion seems to have been made and with a fairly general and understandable opposition to the excise, such accusations would surely have been produced, if there had been even general suspicions, let alone proof.

Incompetence in collection could show itself in two ways. The first would be in the failure to stop wholesale evasions. Small or local failures would not affect the overall reliability of the records: only a really large scale, of the order of 25 per cent. or more of the total, would have that effect. Complaints by manufacturers, dealt with in more detail below, where they concern the collector himself, are in general against his assiduity. Some complaints are against his unpunctuality, but there is no suggestion that he was not a good "Government man". Disputes arose between manufacturers and excise men, not because the latter wanted to under-value the paper and were unable to assess the types correctly, quite the reverse. This in itself bears testimony to their competence to discern between one paper and another.

A further possible cause of major unreliability would arise from what might be termed "internal smuggling". It has been contended that in England, with the statutory returns of output of the mills by the manufactures being only every six weeks and with collusion between manufacturers and their men, considerable evasions took place.¹ However, the collectors were empowered

1. James Whatman in a petition to Chas. Jenkinson, Secretary to the Lords Commissioners of Treasury December 1764. Bm. Add MSS 38203 f.316 given by Balston T. James Whatman Father and Son in App. III. p.149.

to visit the mills at any time of the day or night, to take account of the kinds and quantities of paper there.¹ From 1712 till 1784 every paper manufacturer had to register the address of his premises and from 1784 he had to take out a licence. Thus the whereabouts of each manufactory was known. Only one prosecution for making paper in Scotland without licence or entry has been traced.² In the same year the persons in confinement for paper offences were in England 6, in Ireland 6 and in Scotland 0, while the prosecutions proceeding (including the Lumsdens' licence case) were 4 in Scotland, 26 in England, and 56 in Ireland. In the nine years 1840-8 there were 9 prosecutions in Scotland compared with the English figure of 43 prosecutions.³ A further 11 prosecutions were recorded covering the years 1820-1834.⁴ (In England there were 29 in the five years 1821-6). It is felt that insofar as the prosecutions show at least a sampling of offences, these numbers do not indicate very large scale evasion of excise payment in Scotland, as the average is just under one prosecution per year.

1. 10 Anne C. 19 XLVIII.

2. PP 1831 (346) XV 539 Against James Lumsden Sen. & James Lumsden Jnr.

3. PP 1849 (405) L. 309

4. PP. 1823 XV.

PP. 1826-7. XVII p. 329.

1835. XXXI. App. 30.

In the years prior to about 1820, when it could be said that the hand made method was nearly universal in Scotland, the period of time from rags to finished paper, while varying with the weather, was about 3 weeks. This time lag would lessen the likelihood of large scale internal smuggling, since from the nature of the material it would have to be about the mill for a long and anxious time. As has already been noted, the officers were empowered to visit the various premises enumerated as "the house, mill, yard, drying house, warehouse or any other place belonging ...". In addition to the stocks of paper, the office was to note the quantities of rags, etc. The section of the book Instructions for the Officers of Excise in Scotland¹ devoted to the "officers ... who survey paper makers," gives considerable detail on the carrying out of the various legal requirements of the Acts. One section is particularly devoted to "the avoidance and detection of frauds: " These, and other parts aimed to give the exciseman a clear insight into the problems associated with his calling. Thus with the six-weekly returns and the subsequent fortnightly,² and later daily, output records,³ the manufacturers' opportunities for any large-scale evasions were slender.

1. Instructions for the Officers of Excise in Scotland. Sir D. Hunter Blair and J. Bruce. Edinburgh 1804. Two copies of this work, which covered all the exciseable materials of the period, are in the Excise Library, London. pp.299-312 cover the survey of paper makers and are reproduced in full in the appendix. (p. 283.)

2. 26 Geo. III C 78 S.11.

3. 56 Geo. III C 103 S.

Moreover, unlike spirits or tea or coffee, the commodity, paper, was rather bulky for its monetary value. Thus for instance, Second Demy (20" x 15 $\frac{1}{2}$ ") weighed 24 lb. per ream, and cost in 1725 27/6, which would have included a tax payment of 1/6. Similarly, second foolscap (16 $\frac{3}{4}$ " x 13 $\frac{1}{2}$ ") weighed 14 lb. per ream and cost in 1725 13/9 including 1/1 $\frac{1}{2}$ d. tax. The saving of the excise on the quantities of paper used domestically, makes large-scale general evasion unlikely. The only recipients of internally smuggled paper would be stationers. That there may have been some such smuggling could be deduced from a provision in the act of 1815,¹ that no stationer's business was to be set up within two miles of any paper mill. With the majority of the mills being in the country in Scotland, it is doubtful if this provision had much relevance.

There was, however, another way left in which the manufacturer might evade or modify the excise duty, which could result in a reduction of the reliability of some of the excise records as evidence of quantitative output. In the first period mentioned, 1712-1780, there were enumerated eleven sorts of home produced paper, and on any other sort of paper was charged an ad valorem duty of twelve per cent., which with other increases was raised to 18 per cent. in 1714.² The value of the paper was its value at the nearest market town and was declared on oath.

1. 56 Geo. III C 123 S. XI.

2. 12 Anne C. 9.

It has been contended that, in England, particularly after about 1740, manufacturers consistently undervalued the paper declared under the ad valorem heading.¹ Thus, it has been suggested, far more paper was excised under this head than a computation from the contemporary prices of paper and the total declared value, would indicate. It is not possible to be certain about this tendency, but from the known prices of fine and second demy and fine and second foolscap in 1725,² the percentage of the market price paid as duty on these "specified" papers, varied from under 6 per cent. to 8 per cent. This range also covers the duty on Second Pott. As the ad valorem duty was 18 per cent., it seems likely that even if all the paper declared under this head were sworn at half its real market value, the rate of tax would still have been slightly higher than that paid on the half-dozen or so of the enumerated classes, for which figures are available for Scotland. In the same original act, however, were enumerated for purposes of import or customs duty, a further twenty-eight sorts of paper. Some quantity of most of these sorts was on hand when the act was passed.³ It seems likely that a start was made to

1. Excise-Treasury Letters 1733-1745 f.245. 12 December 1738, In a letter from Samuel Galliot paper maker and Richard Parry "he contended that the ad valorem seldom values paper worth 20/- per ream, about 3 or 4 shillings." The Excise reply was that "... the quantities with 20/- per ream are not great - all other sorts are valued according to their intrinsic worth as approved by the Supervisor and Officer ...". Also Coleman D. C. The British Paper Industry, p. 346.

2. S.R.O. Enrolment books of Warrants Vol. II, p. 159.

3. S.R.O. Excise Accounts.

manufacture some of these other sorts of paper in Scotland, and that they were taxed under the ad valorem heading. If the officer had doubts about the declared value, he could refer a specimen to the Stationer of the excise office for his opinion. By the 1781 Act, the officer might buy, at the declared price, plus 10%, any paper paying the ad valorem rate of 18%.¹ It is unlikely that fine quality papers were grossly undervalued and included in the ad valorem category. Supporting this contention is the fact that there is only occasional mention in the Scottish returns of Fine grades. Crown fine occurs only once, Fine Pott twice, while Demy fine and Foolscap fine do not appear. Second demy, second foolscap, second crown and second pott, however, all occur. The quality difference between fine and second would be noticeable and irreversible. Since the majority of the declared Scottish paper was of the poorer sorts, such as Small ordinary brown, whited brown and large brown capp, it seems most likely that it was variants of these such as blossoms (blotting), sugar blue, tea crown, blues and greys which were made. Such papers would be clearly inferior in value to the white papers. The prices in 1725 for blossoms and bag cap were $7/8\frac{1}{2}d.$ and $6/11\frac{1}{2}d.$ per ream respectively.² The other cheaper sorts have not

1. 21 Geo. III C. 24 c. 9.

2. S. R. O. Enrolment books of Warrants.

been found, but in a list of 1825 the following occur:-¹ Crown tea 7/-, Small hand grey 6/-, Crown grey or 12 lb. 6/-, Demy grey 14 lb. 7/-, Crown brown 5/6, thin demy brown 7/6. Comparison of the prices of other papers in the list with those available for 1725, show reductions of about 10 per cent., so that the prices quoted above are of the right order. A mean figure for the declared value of paper for the ad valorem tax was about 4/- per ream.² This figure can be used in order to convert the ad valorem entries prior to 1780, to reams, so that the total output for each year can be found. It should be mentioned that this figure is almost twice that derived by Coleman from the English figures,³ but for the reasons given above and in the appendix, it is thought to be a reasonable figure for Scotland.

With the use of the figure 4/- per ream for the ad valorem, the whole of the paper in the first period can be converted to reams. As the second-period is recorded in reams, this enables a continuous curve of output to be plotted from 1712 to 1794. For the third period the excise returns are by weight, distinguishing between paper and board till 1835, and thereafter by weight with paper and board combined. In order then to produce an output curve for the whole period of the excise, a computed average weight per ream is required. Computation of the average weight of a ream from

1. Messrs. Dixon Edinburgh Stock list.

2. See appendix. p.325.

3. Coleman D. C. The British Paper Industry App.1. p.346.

the quantities excised between 1712 and 1780 gives 19 lb. After 1780, the larger sizes make a greater proportionate contribution, and 20 lb. seems a more acceptable figure. With these assumptions it is then possible to plot a curve representing the output of paper from 1712 to 1835. As the figures after 1835 include board, the figures for board can be added to the 1712-1835 figures, thus enabling a total output curve to be drawn for the whole period 1712-1861.

During the period of the Excise there were complaints from the manufacturers concerning the effect of the taxes as a restraint of trade and production. Though there were early representations in England,¹ the main source of information on Scottish complaints is the Excise Enquiry of 1835.² At this, twelve Scottish paper makers gave evidence, twice the number from England. This may reflect the growing importance of the Scottish industry, but it is thought that it mainly shows the strong feeling in Scotland against certain aspects of the excise which particularly affected the northern kingdom. Moreover, it would seem probable that with so large a representation, no point of importance would escape notice.

Referring to the background against which the evidence of William Tullis was given, C. D. M. Ketelbey writes " ... This duty was a burden upon the industry which the manufacturers, especially in the years of depression, had striven hard to have removed. Though its rates had been

1. The master paper makers' Memorial to the Commissioners of Excise By Addl. MSS 38203 p.316. Quoted:- Balston Thomas - James Whatman Father & Son, London 1957.

2. PP - 1835. XXXI. Fourteenth Report of Commissioners of Inquiry into Excise Establishment. Paper - London 1835.

simplified and reduced at the beginning of the century, it was still complicated, inequitable, burdensome and irritating. It was estimated to add at least 50 per cent. or even as much as 200 per cent. to the costs of production, to be equivalent to three times the wages bill - - and generally to restrict the consumption of paper and take the profit out of its manufacture ..."¹

These rather surprising figures are borne out from information from Balbirnie Mill.² Two sets of figures for that small mill are given. When operated as a hand-made concern, the daily output was 10 reams selling for £3:10:0. Included in this figure was £2 for duty while the total costs of production, raw materials, wages, coals and rent amounted to 30/-, so that the increase due to the duty was 133 per cent. in this case. Figures for the same mill with a machine give the daily output at 70 reams, selling for £24:10:0. The total costs of production, listed as before, came to £6:12:0 and with the duty at £14:0:0 the percentage was certainly over 200. This shows that with decreasing costs of production a fixed tax naturally assumed larger proportions. From figures for Mugiemoss Mill in 1857 when the duty on first class paper had been halved, mainly as a result of the 1833 enquiry, an even greater proportion resulted. The figures for the seven months January to July, 1858, showed the duty on the paper made to have been £6,919 and the wages £1,553, a ratio of nearly $4\frac{1}{2} : 1$. The total

1. Ketelbey C. D. M. History of Tullis Russell & Co., Ltd. Ch. 2. p. 144.

2. Balfour Papers.

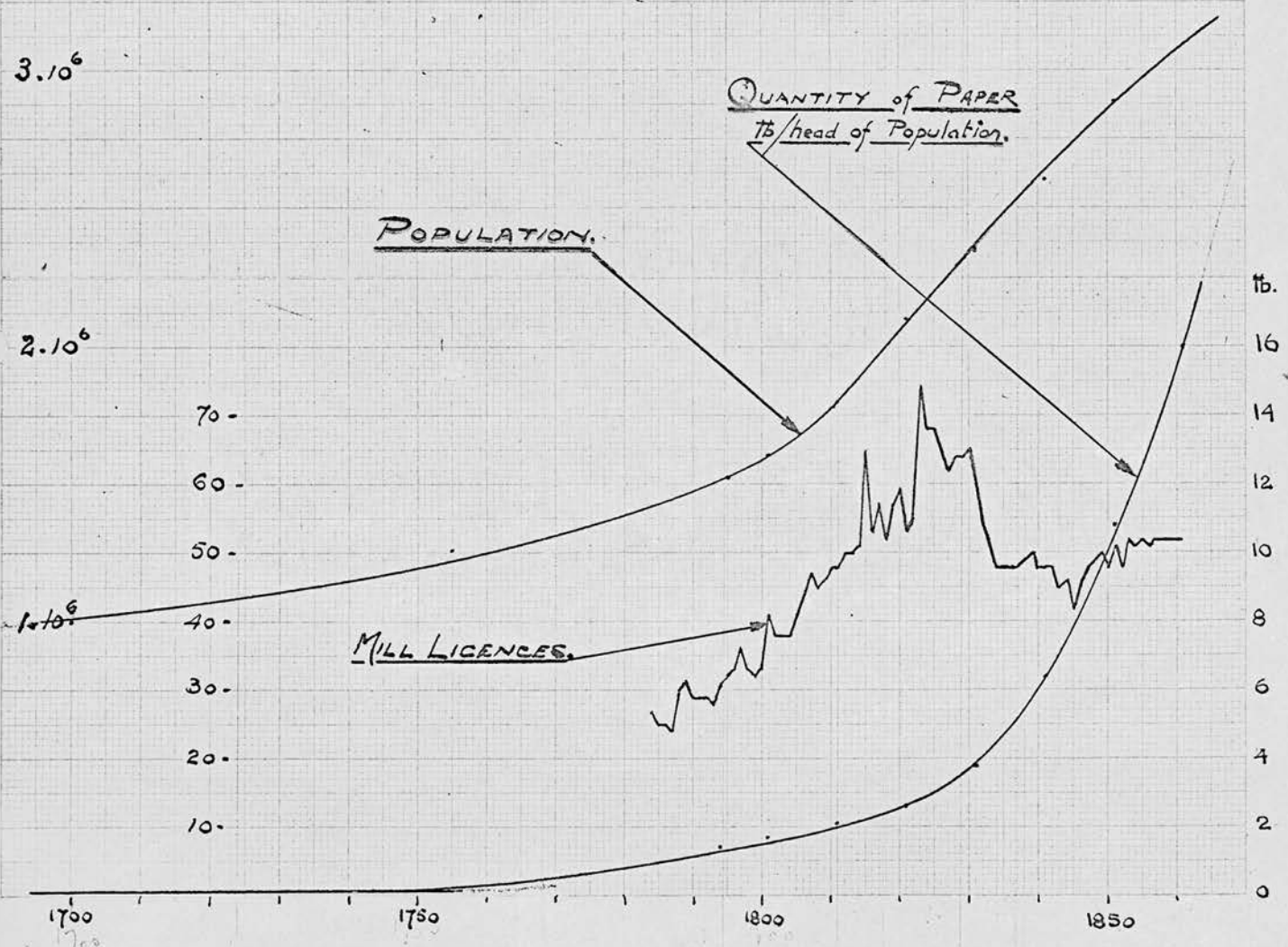


FIG. 1.

costs were £11,261 and the duty payment represented 61 per cent. on this total. A further set of figures from Esk Mills, Penicuik, for 1829¹ shows the duty paid as £6,184 and the wages bill as £1,757 a ratio of $3\frac{1}{2} : 1$. If the calculation of percentage is made on the London wholesale price² the tax of 3d. per lb. varies from 12 to 15 per cent. for first class papers: it was on the heavy coarse papers, greys, sugar blues and wrapping papers that the tax incidence was higher when assessed by weight. Thus while the contentions quoted above are true, the basis is chosen to favour the manufacturers' point of view. Similar calculations would result in even more startling percentages for some of the spirit taxes.

The contentions that the tax prevented the expansion of the industry and took the profit out of the manufacture also merit further investigation. During the hand-made era, from 1784 to say 1825, figures are available³ (see fig. 1 (and table1)) for the numbers of mill licences issued. The curve for over fifty years shows a mean rise of one mill per year which is the net increase per year. Although the figures mask the mill closures that took place, the long steady rise shows, that despite any depressing

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1. Esk Mills Papers.
 2. S.R.O. Enrolment books of Warrants.
 3. S.R.O. Excise Accounts.

Table I - Paper Mill Licences

1784-5	27	1824	68 (53)
5	25	5	14 (62) (figure for part year)
6	25		
7	24	6	62
8	30	7	64
9	31	8	64
1790	25	9	65
1	29	1830	61
2	29	1	54
3	28	2	.
4	37	3	.
5	32	4	50
6	33	5	48
7	36	6	48
8	33	7	.
9	32	8	49
1800	33	9	50
1	41	1840	48
2	38	1	48
3	.	2	48
4	45	3	45
5	41	4	46
6	44	5	42
7	47	6	46
8	45	7	48
9	46	8	49
1810	48	9	50
1	48	1850	48
2	50	1	51
3	50	2	48
4	51	3	52
5	65	4	51
6	63 (58)	5	52
7	57 (53)	6	51
8	52 (57)	7	52
9	57 (55)	8	52
1820	59 (58)	9	52
1	53 (55)	1860	52
2	55 (56)	1	.
3	74 (58)		

Table derived from S.R.O. figures in brackets
from a list in the Excise Library, London.

effects of the excise, there was a continuing and increasing number of manufacturers who found paper-making a viable proposition. The suggestion that expansion of output was grossly hampered by the tax does not seem to be the whole story either. Following the Enquiry, the tax on first class paper was reduced from 3d. to $1\frac{1}{2}$ d. per lb. That this would result initially in a loss of revenue was expected, but it was thought that greatly increased consumption, following the tax reduction, would very quickly restore the Government's income. In the event, however, it was not till 1843, seven years after the change, that the revenue exceeded the 1836 figure in Scotland. In England it took thirteen years.¹ During this period consumption increased in most years but it dropped slightly from 1839-41 in Scotland and from 1839-42 in England. It would seem that the excise was not the main or even a major

1. A close examination of the excise figures for 1835 and 1836 raises doubts as to possible misprints. In the returns for England the Class 1 paper is shown as 45,329,243 and 53,300,953 an increase of 7,971,720 which would have brought in an extra £99,646. The reductions in Class 2 paper (@ $1\frac{1}{2}$ d./lb.) and of board (even if all were rated at 28/-/cwt.) do not give a revenue drop of £9,741 or 7.4%. If the revenue figure is correct, then the class 1 paper must have been even less than 43,300,953.

In the case of the printed returns for Scotland, the amount of duty is far too high for the quantity of paper. If the cost is right, then the class 1 paper should be 8,051,261 lb. not 6,051,261 as shown and even another 1,000 lb. of board would not quite make the amount correct.

factor acting against expansion, either in the hand or the machine-made era.

The rest of the complaints raised by the manufacturers at the enquiry did not directly impugn the excise as having an influence on the development of the industry but rather as producing certain inconveniences and irritations. The main objection was to the need for the paper, having been examined and stamped, to remain in the mill for twentyfour hours after the officer had left so that the inspector could re-weigh it, should he so desire. This regulation frequently resulted in more than a week's delay from e.g. Aberdeen where sailings were weekly. It was contended that the prior notice to the officer should make allowance for this known shipping day, but delays to the officer or in the examination meant that his departure might be delayed and the twentyfour hour period started with his departure. No concession was made on this point.

A second complaint was that a paper maker had to pay duty on the paper for wrapping his reams, if he was not in the way of making such paper himself. That is, if he obtained his wrapping paper from some other mill it was dutiable, but if he made it himself it was free of duty (for the purpose only of wrapping his own paper). This was felt to be a hardship to those manufacturers making fine paper, who were unable to adjust their machines to make the coarse brown paper.

A suggestion which might have been more acceptable had the industry been more mechanised at the time, was that the duty on the paper itself should be abolished, and revenue obtained by means of a large licence fee

based on the power of the mill. This, however, was not thought to be practicable.

Another objection raised by the manufacturers, which touched more directly on tax evasion, concerned the definitions of 1st Class (3d. per lb. tax) and 2nd Class (1½d. per lb. tax) papers. Under a section of the 1802 Act¹ paper of the second class was defined as brown, "... made of old ropes and cordage only, without removal of tar or mixture of other materials." The rest was of the first class. Complaint was made, particularly in England, that some manufacturers were having excised as second class, paper which should legally have paid at the rate for first class. There was in this, however, no suggestion that the quantity was in any way false, and it is felt that this does not invalidate the claim that the excise records form a reliable record of the progress of the Scottish Paper Industry. The other complaints by the manufacturers concerned the consolidation of the law, the use of different coloured labels for paper originating in the three countries, England, Ireland and Scotland, and the very high penalties which could be incurred for inadvertent contravention of regulations. When questioned on the matter of fraud, manufacturers and excise officers alike thought the amount in Scotland was small, and if it occurred would be with the re-use of excise stamped labels.

1. 42 Geo. III C 94 S.X.

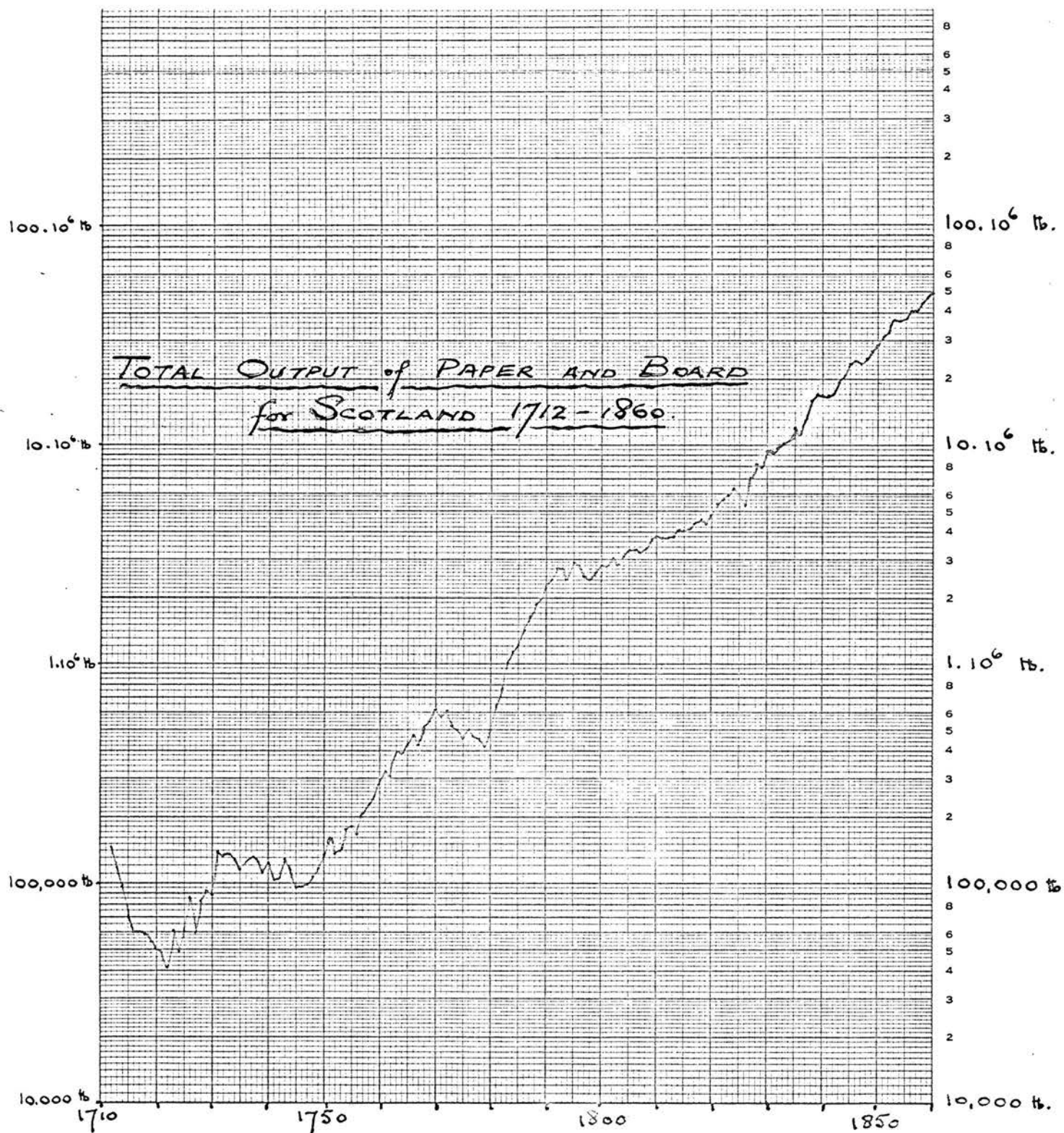


Fig. 2.

On the whole, therefore, it would seem that the manufacturers did not establish that the excise, though no doubt inconvenient and even a heavy tax, had a major formative influence on the development of the industry. On this basis and for the various reasons given, it will be taken, that the available excise records provide the material which reflects, and did not itself determine, the growth and development of the Scottish paper industry.

Excise Curve

The curve of the total output of paper of all sorts and board is shown in fig. 2. Although it shows an overall rise from about 1715 to 1861 of about 5 per cent. per annum, there are several distinct phases in the period. The first of these extends from the beginning in 1712 to about 1723 or 1724 and during this time the output fell from 150,161 lb. to 43,068 lb. in 1722 and was only 51,832 lb. in 1724. It is not possible to be sure of the output prior to 1712, but from the shape of the curve, it seems reasonable to assume that it had been falling for at least a few years prior to this date. Now when the Act of Union was passed in 1707 it put the Scottish economy on a footing with the English and, though this was advantageous for cattle exports to England and tobacco imports from the American colonies, there were counteracting difficulties. In the paper trade England had

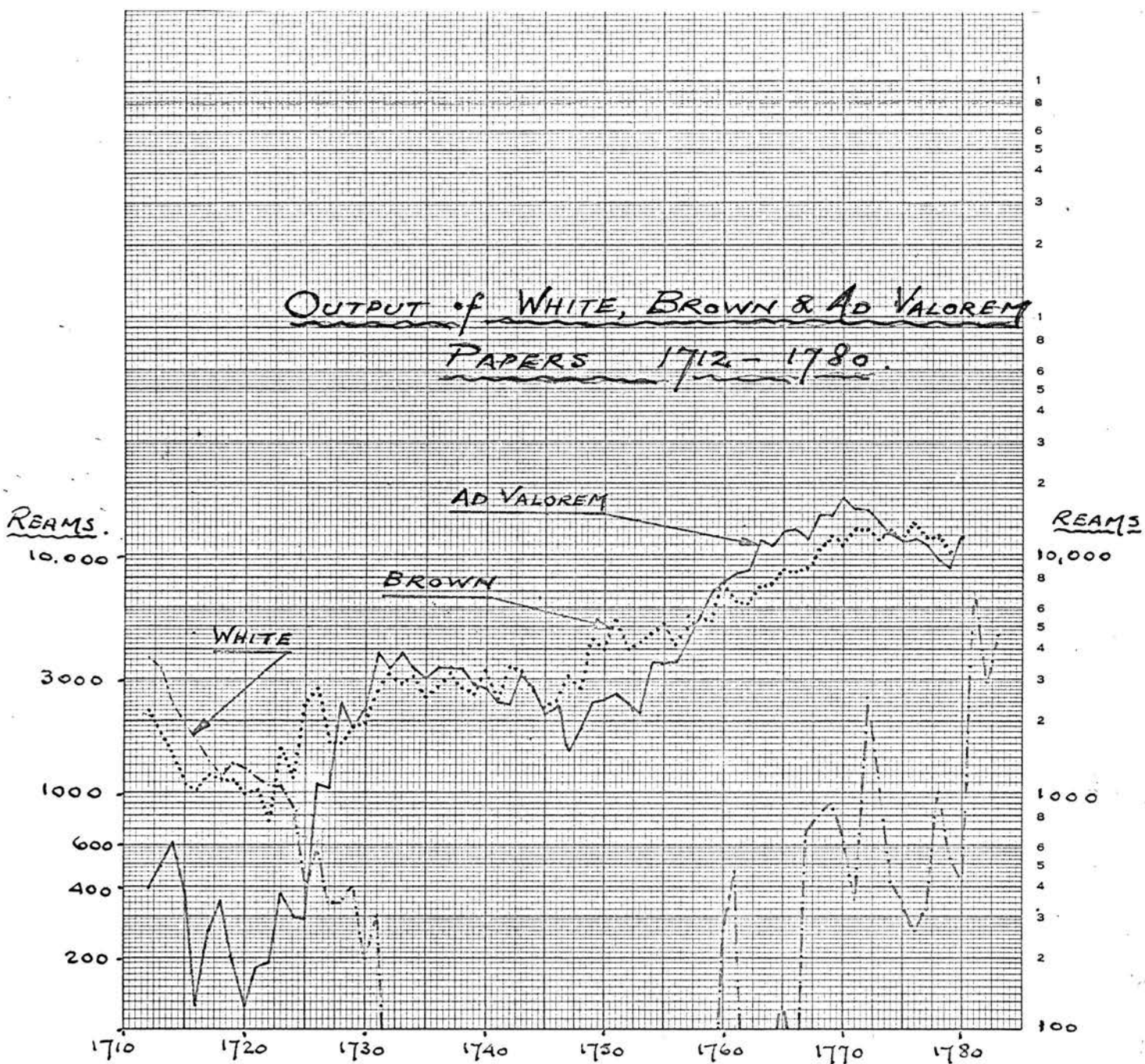


FIG. 3.

100 years longer establishment than Scotland¹ and the industry was considerably larger in the southern kingdom.² With the opening of the trade frontiers it seems very likely that imports from England had an adverse effect on the paper industry in Scotland. Reference to fig. 3 shows the output of white, brown, and of the unspecified "ad valorem" sections of the output. From this curve it is seen that the proportion, as well as the output of white paper, fell in the period under review. As during the ensuing part of the hand-made era the output of white papers in Scotland was small, it seems likely that the longer-established English industry increasingly supplied this type of paper to Scotland. Evidence of this imported supply of white paper comes from the quantities of paper used by Robert Foulis, printer to the University of Glasgow, from 1st April, 1743, to 1st April 1766.³ In this list there are types of paper which do not figure in the Scottish excise returns. These include Fine Foolscap (3161 rms. 11 q.),

1. Ch. 1 p.4.

2. In 1712 the Excise revenue from paper in England was seventy times that in Scotland.

3. S.R.C. Enrolment Books of Warrants, Vol. III, p.141.

Fine Pott (902 r. 16 q.), Crown Fine (131 r. 7 q.) and Demy Fine (167 r. 12 q.). Of the seconds of these types only second Pott was produced in considerable excess of the amount used by this one printer: of the others he used some eighty reams more than the whole Scottish output during those twenty-three years.

The contention of fairly heavy paper imports from England is supported by William Creech's assertion in Fugitive Pieces;¹ "... In 1790 ... there were twelve paper mills in the neighbourhood of Edinburgh; and a vast quantity of printing paper was sent to London, from whence it used formerly to be brought."

From about 1745 to 1770 there was a steady rise in output. As already mentioned, figures for the number of mills in operation in Scotland are not available prior to 1784 but information on the dates of establishment of certain mills gives the figure of ten between 1742 and 1764. Allowing for an element of doubt in some cases, this still indicates a fairly steady rate of establishment. Other excise figures² show from 1764 the

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1. Wm. Creech Fugitive Pieces Edinburgh 1791 and 1815 p. 81. Wm. Creech, bookseller and publisher on his own account from 1773 till 1815, had taken over the whole of the partnership he had had with Alexander Kincaid (King's Printer in Scotland) to whom he had served an apprenticeship. Kincaid had carried on his business in the same premises as James McEwan to whom he had been apprenticed so that the publishing and bookselling business of Wm. Creech had very long roots.
 2. S.R.O. Collectors Statements of Accounts.

returns for paper of the various Collections. From 1764 till 1770 they show no rise in the Aberdeen collection, a small rise for Ayr and from 1766 a rise for Dumfries. Haddington shows the greatest rise and as this collection was responsible for the Penicuik area, where six of the ten mills mentioned above were situated, this would seem to be the area mainly responsible for this upsurge in the Scottish paper industry before 1770. Another significant increase is recorded for the Linlithgow collection and this is accounted for by the establishment in 1761 of the mill (still in operation) at Midcalder. The figures for Edinburgh also show a rise. Thus the main area of increase can be said to have been around Edinburgh. This seems reasonable in view of the importance of the capital and of the increasing commercial activity as evinced by the establishment of the Royal Bank (1727) and by the entry into banking business of the British Linen Company.

Despite a fall in paper output from 1770-1780 of just over 2 per cent. per annum, to be discussed presently, it seems that the 7.5 per cent. rise from 1745-1770 was not too rapid since the output subsequently attained by 1780 would have been reached by a continuation of the 1745-1770 rate of rise. That is to say, it seems that apart from the recession from 1770-1780 the economy, as measured by its ability to absorb paper, expanded at a fairly steady rate from 1745 to 1795. This rate of rise of some 7 per cent. was possible of achievement when the industry was small, but when it had attained the 1780 output figure of nearly three million pounds it was more

difficult to maintain the same rate of rise. However, the rise from 1780-1790 was, on a percentage basis, quite phenomenal - 16·5 per cent. and on an absolute basis the output rose from half a million to over two and a quarter million pounds per annum.

This ability of the hand-made paper industry in Scotland to expand so rapidly confirms in a dramatic way the evidence of James Low, Wholesale Stationer and paper maker, to the Select Committee on Fourdrinier's patent.¹ He was asked if he thought the size and quality of the paper could ever have been produced such as it was then (1837) unless the machine had been invented, and with the expedition with which it was manufactured? His reply was that as good a quality but not the size could be produced; the advantage applied to the size and to the facility for getting a large quantity. He went on to say that the machine did not, in fact, increase the quantity of paper produced: that was determined by the power to reduce rag to pulp. 'The quantity', he said, could unquestionably have been produced by hand.

This view is no doubt correct but it is clear that the cost would have been greater and a number of larger mills would have been necessary. It is clear from fig. 4 that the establishment of new mills continued at the average rate of one per year over the period 1790 to about 1825 but the rise in output from 1790 to 1820 was only 2·5 per cent., a very sharp fall from the 1780-1790 rate and even from the 1745-1790 rate.

1. PP. 1837. XX. Report from Select Committee on Fourdrinier's patent, 1 June, 1837.

This can be attributed to the war which not only affected exports, but more seriously the imports of rags. Writing to a customer in Edinburgh in April 1805 the proprietor of Esk Mills, Pennycuik, said, "... the great change which has taken place in the price of materials by the shutting of all the ports on the Continent ... rags that were 6/6 per stone are now 10/-. and Smaltz at 2/- are 9/6 and both likely to advance ..."¹. These advances were of course reflected in the prices of paper, e.g., Bible Crown which was 9/- per ream in October 1805 had risen to 14/6 by April 1808 and Royal Gray which in June 1806 was 12/- per ream had risen by the same date in 1808 to 18/-.²

Returning now to a consideration of the fall in output from 1770-1780 this follows the depression discussed by Hamilton.³ "The year 1771", he says, "marked the peak of a long rise in economic activity". There were major schemes like the Forth and Clyde Canal in train as well as individual expansion of industrial concerns. In The Capital the project of building the new town to Craig's design got under way in 1767. The linen trade was in expansion and as well as the new banks in Dundee, Perth, Aberdeen and Ayr,

1. Esk Mills papers. Correspondence book.

2. Ibid.

3. Hamilton H. Economic History of Scotland, Oxford 1963.

other concerns which had previously combined banking with commercial activity decided to confine their activities to banking. These included the British Linen Company and John Coutts and Company. Although there was all this industrial activity and a good deal of land improving there were individual failures. Then most of the newer, small banks were issuing notes of small denomination and using the option clause.¹ By an Act of 1765², however, the minimum denomination of notes was to be £1 and this restricted considerably the scope and activities of the smaller banks. This may well have initiated the movement which resulted in 1772 in the failure of the Ayr Bank, but fundamentally we see on a national scale what so often caused individual failures: a lack of capital. Following the restrictions on the smaller banks, the larger banks, in the summer of 1771 stopped discounting the Ayr bills. Much of the Ayr Bank's fairly readily granted credit, came back to the bank in the form of its own notes, much of its security was in landed estates from which it was much too slow a process to raise funds and as dealt with by Adam Smith³ the bank had recourse to the expensive practice of drawing bills on London. The failure

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1. By this clause the bank could refuse cash payment on demand and offer payment, with interest, in say, three months' time.
 2. 5 Geo. III. C.49.
 3. Smith, Adam. Wealth of Nations. Everyman edn. Vol. 1. pp. 278-82.

of Neale, James, Fordyce and Downe started a chain reaction which saw the closure of ten banking houses and ultimately of the Ayr Bank.¹ One result of this failure and of a certain distrust in London, was an unwillingness to accept Scottish bills. As a very large amount of trade was paid for by means of bills this meant an inevitable slowing of trade. This was seen not only in the paper industry but also in linen, in the cessation of work on the Forth-Clyde Canal and on Edinburgh's New Town. Nevertheless in the period 1770-1780 there seem to have been better years and bad years. Thus Hamilton reports 1777 as flourishing yet, at its close, with clear signs of a recession. It seems that the whole Scottish economy, though expanded, was short of ready capital and sensitive to any recessive influence such as bad harvest, loss of American tobacco import/re-export trade, or lack of confidence in local bills. When such a state of affairs existed it was certain to be reflected in the paper industry which itself is so much the handmaid of other industries.

From about 1779, however, till 1790 occurred the most phenomenal rate of rise of output in the Scottish paper industry. It is the more remarkable in that it lasted so long. Though it was also a period of expansion in England, during which the excise revenue from paper was multiplied five and a half times, in Scotland this part of the revenue was multiplied nine times in the same period.² There is no doubt that the period was one of

1. See Hamilton H. Economic History of Scotland, Ch. 12, pp. 314-327.

2. Appendix to the fourteenth report of the Commissioners of Excise Enquiry, 1834.

Date	lb. of Paper	
1762	2,660	
*		
1774	29,829	(Ireland only)
5	12,234	
6	27,630	
7	51,053	
8	20,488	
9	2,936	
1780	30,333	
1	37,788	
2	20,674	(Ireland only)
3	34,888	
4	9,134	(Newfoundland only)
5	450	(Newfoundland only)
6	52,685	
*		
1788	95,146	
9	81,532	
90	91,700	
1	86,163	
2	178,915	
3	122,220	
4	77,331	
1795	92,325	
*		
1801	57,139	
*		
1806	111,678	

EXPORTS OF PAPER FROM SCOTLAND
S.R.O. Customs Records R.H.20. (20 Vols.)

general economic expansion with cotton an increasingly important commodity. Consumption of paper closely reflects the general economic boom at home, and in addition a considerable trade with England had developed as noted by Creech who, writing in 1791, reported that " ... in 1790 a vast quantity of printing paper was sent to London ... "¹ From figures of the amount of duty recovered for the export of paper from 1780-1790² it can be computed, on the assumption that the incidence of tax on the quantity exported was the same as on the total, that the quantity exported was a little over 400,000 lb.⁴ This amounts to 2.65 per cent. of the Scottish output for this period so that exports overseas (as distinct from the unrecorded sales in England) did not account for the great increase. Even on a year to year basis the highest was in 1790 when the percentage was 4.6. The only explanation thus seems to be high exports to England (mainly London) and a large increase in home consumption. Reliable population figures for Scotland are not available for the period but taking Kyd's figures for 1755³ and 1790 there was an increase of some 20 per cent. in the 35 years so that if the rise rate is assumed constant, then for the years 1780-1790 an increase of about 5.5 percent. in population can be assumed i.e., a rise of about 75,000 souls.

1. Creech. Fugitive Pieces Edinburgh 1791 & 1815 p.80.

2. S.R.O. Excise Records.

3. Scottish Population Statistics. Ed. Sir James Kyd. 1952.

4. Figures for paper exports recently consulted in S.R.O. are given in the table. These confirm the calculations.

Though this is a significant number it could not have had an immediate effect on the paper consumption which is determined by the adult population. However, the increase in population shows small expansion compared with the early XIXth century. The full explanation then of the very high rate of rise of paper production in the period remains to be determined.

Following the slower rate of increase of output during the Napoleonic wars already dealt with, there followed from 1820-1861 a rate of rise of just under 6 per cent. This can be considered as the machine age. Though the Fourdrinier machine made its first appearance in Scotland as early as 1811 at Peterculter¹ it was not till 1825 that it could be said to be important in the industry. However, it made its contribution to the continuing expansion of the industry at a time when its output expressed as a percentage of that of England was also rising. Two main effects of the use of the Fourdrinier machine were that it reduced the time of production and produced large and continuous rolls which subsequently enabled cylinder printing machines to be used. In, then, this "machine period" the output in Scotland rose from 5 million to 50 million pounds per annum, a figure which would seem to confirm the contention that the excise was not a major factor in restricting the development. Over the whole period of the excise from 1712 to 1861, taking the original and final figures, the expansion in Scotland was at the rate of 4 per cent. per annum.

1. Chalmer's Caledonia Vol. VII, p. 232.

CHAPTER FOUR

Finance

In dealing with the finance of the industry such questions arise, as How much capital was invested in the industry? How much did it cost to establish a mill - and of what size? Were there many sizes? Did one size predominate at one particular time and was there a change? Where did the capital come from? Who were the men who ran the industry? What were the causes of failure? and What were the profits? In this chapter an attempt will be made to answer some of these questions. In the analysis which follows it is hoped to determine the over-all costs as well as the relative costs, of the buildings, the machinery and the utensils for the Scottish paper mills particularly in the hand-made era - say up to 1820 or so.

Classification of the mills.

Paper mills may be classified by the number of their vats, or by the number of beaters installed, as was done in the government enquiry of 1851. The difficulties of obtaining precise information of untraced (and unrecorded) expansion and contraction over a period of time, make this impracticable for the present work. However, the amount of capital employed in an industry is clearly a primary measurement of economic importance - even though this may not tell the whole story. The valuation is itself a difficult task, but contemporary insurance policies form a useful source of such information and the Sun Insurance office books record paper mills in Scotland from February 1758.

Sixty policies (concerned with some 40 mills) from the Sun and other offices have been examined covering the period between this date and July 1820. Over this whole period of just over sixty years, the average number of mills in operation was thirty, so that the forty mills insured and re-insured can be taken as numerically representative of the whole. Such a series forms a reliable guide to the magnitude of the enterprises at contemporary valuations. That such valuations were conservative - at least in the earlier decades - is deduced from the fact that the rate of the premium increased as the capital sum covered was raised.¹ This would discourage the idea of inflating the cover beyond its true figure. The series of insurance policies, together with the upset or realised sale price of mills, share capital and mill accounts, will form the basis of the estimates of the capital values of mills.

Some of the policies are renewals on the same properties, but there are eighteen separate enterprises available before the year 1800. In the period 1784 to 1800 the average number of mills licensed was 30 per year: before 1784 the number was considerably smaller.² Though there were certainly

1. Caledonian Mercury 23 April, 1760. Sun Fire Insurance Rates

Sum Insured	Common Insurance	Hazard Insurance
Any sum not exceeding £200	4/-.	6/-.
Any sum from £200-£1,000	2/- per cent.	3/- per cent.
Any sum from £1,000-£2,000	2/6 per cent.	4/- per cent.
Any sum from £2,000-£3,000	3/6 per cent.	5/- per cent.

2. Licences were required to be taken out by paper makers from 1784 (24 Geo. III c.41) and so figures are available from that date. Before this one has to rely on knowledge of the establishment of mills.

closures and new mills, the policies seem to be a fair representation. From 1800-1820 the policies numbered 22 and the licence average for this period was 48.

For convenience in classifying the mills, the capital sums insured were arranged in groups (a) £1,000 and below, (b) over £1,000 and up to £2,000, (c) over £2,000 and up to £3,000, (d) over £3,000 and up to £4,000 (e) over £4,000. It was found that only two mills occurred in group (c). The mean of these two was £2,170 and they were included with the ten in group (b). From group (e) one mill at £8,000 was excluded as being unusually large. The means of the four resulting groups were (a) from twelve mills, £575, modified (b) from twelve mills, £1,640, (d) from five mills, £3,400, (e) from five mills, £4,760.

That these figures are of the right order is confirmed from figures of sales, valuations and establishment of mills. The cost of the erection of the one-vat Herbertshire mill in 1788¹ was just over £500. Then in 1796, on the death of Alexander Smith, the owner, Stoneywood Mill, Aberdeen, was valued at £484.² In the next group there was the valuation in 1813 of Rothes Mill at £2,000³ and in 1840 at £1,910.⁴ To illustrate the third group,⁵ Springfield Mill, Polton was bought by Samuel Shaw in 1785 for £3,020.

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1. Herbertshire Documents - 64 receipts covering the building of the mill and its fitting out with vat, engine, chest, tables, moulds, felts, etc. The total was £516/3/4¹/₂.
 2. W.P.T.R. 6 June, 1913.
 3. Rothmill Quarterly Vol. XXX, No. 2 p. 71.
 4. Ibid No. 3 p.146.
 5. S.R.O. Register of Deeds, Mackenzie Office 264. p.110. 25 Dec. 1798.

Then Messrs. Nisbet and McNiven's six-vat mill at Balerno was erected in 1788 at a cost of £4,200,¹ while on 28th February, 1821, Peterculter Mill was sold for the upset price of £4,050.² That larger enterprises existed, even in the early days, is shown by the share capital of the Scots Whyte Paper Manufactory of 1694: this amounted to £5,000.³

It is difficult to obtain precise continuing information about the numbers of vats in the mills but it is fairly certain that those mills in group (a) were one vat concerns. This perhaps may be qualified to the extent that not all mills had the same value of buildings and machinery, so that in this group there might well be some mills with two vats. It should be noted, that even such "machinery" as the beater was often made at the mill by the local or mill joiner and whitesmith so that differences in value were inevitable.

A fairly fully documented instance of this occurred at Esk Mills in 1805 and 1806. In the first letter, to a London supplier⁴ the proprietor requested, in addition to 32 pieces of strong English Oak - and 24 pieces of strong English Elm ... "1 piece of English Elm (a root-cut is best) 9 feet long to work to 25 inches diameter perfectly round." This was for the rollers of two Hollander beaters. Then, writing to a local firm⁵ he sent a quantity of pieces of lead from which to make the linings for the two engines as well as for two

1. Signet Library O.S.P. 206 No. 8.

2. Cormack, A. A. Our Ancient and Honourable Craft - 1933.

3. "Articles concluded and agreed upon by the Society of the White paper paper manufactory of Scotland ..." p. 1. Appendix p. 275.

4. Andrew Mackenzie London 26th April 1805.

5. Laing & Miller Edinburgh 12th Feb. 1806. (Listed in Campbell's Edinburgh Directory of 1805 as Lothian Road and in Stark's 1807 Potter-row).

stuff chests. The linings were to be 9 lb. per square foot and 7 lb. per square foot respectively. Other consignments of lead were sent for making 1 $\frac{1}{2}$ inch and $\frac{3}{4}$ inch piping.¹ Clearly local knowledge and experience dictated the various sizes. The actual woodwork was not done at the mill, for he wrote "... the engines are the same size as you did for Mr. Cowan ..."

Locally made beaters seem to have been the order of the day. John Hall of Dartford did business in Scotland and supplied presses to the same, Esk Mill, but the beaters and stuff chests and vats were evidently considered to be within the capabilities of the local tradesmen.

The same attitude is also found in the Cowan mills at Pennycuik. In addition to the engines mentioned above, it is seen from the Wages book that three or four millwrights, two masons and a wright² were regularly employed. That these men worked about the mill is confirmed by a long entry in March 1808 concerning plates for hot-pressing, a bleaching copper, a boiler, a mounted furnace, and 16 small rollers for hogs. Thus a considerable amount of local "small engineering" and local manufacturing was done and as indicated above, there could therefore be considerable variation in performance and in size, between the apparatus at different mills.

In the next group of mills, up to about £2,000, there would normally have been up to four vats. There is reason to suppose that Messrs. Nisbet and McNiven's six-vat mill at Balerno, which cost £4,200, was somewhat expensive, partly due to the bankruptcy of one of the original builders, which

1. 6th and 12th March 1806.

2. A joiner would perhaps have been expected, but surprisingly the "wright" seems to have been such for he was paid £1/1/- in March 1808 "for Andrew Wilson's coffin."

meant engaging another to complete the job. The line of demarcation, however, is not rigid, for the sizes of mill enumerated are estimated from means of valuations, and £100 or so either way might cover the installation of another vat. If, however, such additional vat entailed a further beater and stuff chest, it would carry the mill into a more expensive group than if it was just taking up the output of a fairly large or particularly successful beater section.

Estimate of fixed capital in the industry.

If the 18 mills covered by the insurance policies up to 1800 are taken as a representative sample of the mills of the country as a whole, then, from the number of mills licensed, the total capital value of the industry can be estimated. This figure comes to £52,000. Allowing for the value of the £ before 1800, this still seems fairly low. The average annual output of paper and board from 1780-1800 was over 2 million pounds or about 850 tons, of which some 30 tons were board. The total annual value of the output of the industry therefore must have been around £50,000. It should be remembered that output was rising during the whole period and that the prices are not accurately known for every sort of paper. Giving due weight to these caveats, however, the figures do certainly show the order of the size of the capital to output ratio of the industry.

The pattern from 1800-1820 changes somewhat, for there was an increase in the number of owners operating more than one mill¹ as well as in

1. Chas. Cowan, Valleyfield, Low, Bank, Robt. Weir, Cathcart, Carrongrove, Herbertshire, Wm. Cadell, Auchendinny, Pegg's Mill, Polton. Chas. Davidson, Bucksburn, Mugie Moss, Stoneywood.

the size of the mills in operation. This can be represented as a concentration of ownership and certainly the trend towards larger mills continued after the introduction of the machine. In 1851 when the government enquiry was made, it showed that the average number of beaters per mill in Scotland was six, compared with an average of four in England.¹ This fact goes some way towards explaining the magnitude of the rise in output in Scotland, as compared with that in England, from 1800 to 1850 as noted by C. D. M. Ketelbey. The figures were that in 1800 Scottish mills contributed 9 per cent. of the United Kingdom output, but by 1850 the percentage was 22.²

In the period 1800-1820, calculated on a similar basis from a series of 20 insured mills and with the same assumptions as for the pre-1800 period, the estimated capital investment rose to about £125,000. This is partly due to an increase in the number of mills (the average for the period was 48 compared with the average for 1780-1800 of 30). Partly too, the increase was due to the increase in numbers of larger mills. The mean output over the period 1800-1820 was nearly 1,700 tons (just double that for the period 1780-1800) and as this was a time of high prices, the yield could well have been of the order of £150,000. Moreover, as this figure is derived from the mean output, it is quite conservative, for in 1820 the number of reams of paper produced was approaching 250,000 besides more than 150 tons of board. If the individual 1820 figure of 57 mills be taken, in place of the mean figure of 48 for the whole period, the scaled-up investment of about £150,000 is still

1. B P P 1852 Vol. L1 Accounts and Papers.

2. Ketelbey, C. D. M. Rothmill Quarterly Vol. XXX No. 2.

considerably below the output yield for that year: a result compatible only with an industry using very little administrative or unproductive labour but having a fair amount of circulating capital. Such, of course, was the paper industry in Scotland with the proprietor and often his family active "producers" in the mill, and with the "invisible" excise credit of six weeks.

Analysis of Capital Costs in Paper Mills.

In setting up a paper-making establishment, it might well be possible to obtain possession of an existing grain-, snuff- or other type of mill in the locality. In this case the water-wheel and prime drive shaft, and the main and subsidiary buildings would already exist. The amount of new machinery and equipment required would thus be greatly reduced. An example of such a purchase was that by Robert Tullis of the Auchmuty Grain Mill for £400 in 1809 when James Stronach failed. Tullis converted this to paper-making and in 1813 the mill and contents were valued at £6,000,¹ which seems a high figure, since in 1806 it had been insured for only £600.² However, it illustrates the purchase of the prime-mover part of a mill, ready-made.

The differentiation in costs between buildings, machinery and stock may help in estimating the cost difference between setting up a whole enterprise, and adapting an existing concern for the production of paper. In this respect the insurance policies are not as informative as one might wish. In nearly

1. Ibid.

2. Caledonian Fire Insurance Policy No. 1120, 24th Jan., 1806.

all instances the buildings are separately specified and valued: in a few cases the cover is on "a paper mill and machinery". Taking the groups already established, the mean values of the buildings were respectively £200 for the group (a) or £575 concerns, £700 for the £1,640 group, £1,300 for the £3,400 and for the larger group. This coincidence of the amount covering buildings is probably due to the small sample and the separation of the owner's house as noted below. The building figures are approximately in the ratio 1:3.5:6.5:6.5 whereas the figures for total cover are in the ratios 1:2.8:6:8.25 showing that in the medium-sized enterprises relatively more seems to have been invested in buildings and that as the size of mill is increased, a smaller proportion of the total investment was in the buildings themselves. This may seem somewhat surprising at first: the installation of an extra beater and vat might have involved no great addition to the buildings, but it would have meant a doubling of the drying lofts, and in the largest mills one would have expected an increase in investment in buildings. There is in this context a feature of the larger mills which arose, and that was the emergence of household goods, furnishings, books, and sometimes silver as well as a house. This was quite distinct from workmen's cottages and perhaps might be included in buildings. It is however shown separately in table 1 below.

A distinction is made in most of the policies between "machinery" and "utensils": some of these are specified as "fixed". Often there is a combined entry "utensils and stock". Particularly in the small mills, the policies do not always significantly distinguish between "machinery" and "utensils". Thus in some instances "machinery" is not mentioned at all: in some, "utensils" do not occur, and the particular groupings are not

consistent.¹ It would seem that when used in the context of a drying-house, "utensils and stock" would include a considerable quantity of paper. In the sizing-house however, "utensils" would predominate over stock. The interpretation, therefore, of some of the figures, is somewhat subjective, but the pattern is felt to be reasonable.

The "machinery" cost was found to average £190 for the small mills, £300 for the next size, for the larger units £750 and £1,050 for the fourth group. The ratio here is approximately 1: 1.5: 4: 5.5 corresponding to a "buildings" ratio of 1: 3.5: 6.5: 6.5. This shows that in the larger concerns a proportionately smaller amount was spent on machinery, in fact the machinery cost was the smallest proportion of the cost of a mill, and this held till the advent of the paper-making machine and steam engine. One explanation of this may be that in the larger mills the beaters were kept in more constant operation. It has already been explained that the beater was at once the limiting and the decisive factor in mill production.² The beater of the early XIXth century had a capacity of 112-130 lb. of rags and in a twelve-hour day was capable of producing about 6 cwt. of pulp.³ Thus in the larger mills a smaller proportion of the capital investment would be in machinery. Such a state of affairs would be

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- | | |
|--|--------|
| 1. Paper mill with the utensils and machinery | 531913 |
| Utensils stock and machinery | 526164 |
| Paper mill and machinery) | |
| Utensils) | 524465 |
| Machinery) | |
| Utensils and stock) | 525845 |
| Paper mill) | |
| Utensils and stock) | 501464 |
2. See above ch.2 p.
3. Edinburgh Encyclopaedia Vol. XVI, p. 281

expected to have resulted in greater quantities of paper being about the mill since the whole process took up to three weeks. This is confirmed by the figures for "utensils and stock" in which, as stated above, "stock" would probably predominate. In the small mill group the mean figure for this heading was £185, for the second size £490 and in the third size £1,050 and for the fourth group £2,010, giving ratios of 1: 2.75: 6: 11. This seems to show that in the largest mills, the output or stock was proportionately considerably greater and this fact is emphasised more strongly when an entry for a separate warehouse occurs. Such were frequently owned by the larger concerns and examples of the value of stock in such warehouses range from £300 to £2,500.

The picture then which emerges is of small mills with buildings valued at about £200 containing machinery of about the same value or slightly less - £190 and with utensils and stock of - about £185. However, as pointed out above, there is a somewhat anomalous position with the smaller mills. Although it is clear that all mills must have had both machinery and utensils, they do not always both appear in the insurance policies and not too much reliance should be put on the relative amounts for machinery and utensils. It would seem that the machinery figure is slightly high. In the larger mills the position is more specific. The next size of mill then had buildings to the value of about £700 with machinery to a little less than half that value and utensils and stock at £490. The third size of building was valued at some £1,300 with machinery at about £750 and stock and utensils £1,050 and in the largest mills Buildings of the same value, some £1,300, Machinery worth £1,050 and Utensils and Stock valued at some £2,010. All the average figures for the four groups are:

AVERAGE (INSURED) VALUES OF PAPER MILLS

<u>Size of Mill</u>	<u>Buildings</u>	<u>Machinery</u>	<u>Utensils & Stock</u>	<u>Other (House etc.)</u>	<u>Total</u>
(a) Small	200(35%)	190(33%)	185(32%)	-	575
(b) Medium	700(43%)	300(18%)	490(30%)	150(9%)	1640
(d) Large	1300(38%)	750(22%)	1050(31%)	300(9%)	3400
(e) Very large	1300(27%)	1050(22%)	2010(42%)	400(9%)	4760

In the table the percentages under each head are also given and these show clearly that in general, the machinery cost is the lowest part of the cost of setting up a mill. In the smallest size this figure is larger. This indicates certain minimum requirements such as water wheel and gearing, a beater and press. Such vital machinery could however often support two vats and even if this was not the case, the water wheel and gearing would not require to be duplicated. The low percentage for buildings in the smallest size indicates that for such paper mills almost any accommodation would be suitable. Small adaptations could be made and no very large scale changes from, say a snuff mill, would be called for. This is perhaps borne out by the high figure for buildings in the second size of mill (43%). In this instance the additional drying space needed to cope with a second or third vat would call for more lofts with rag-storing and sorting space under. In the largest size, the small amount devoted to the buildings (27%) is perhaps surprising. It may be that the mills were not in fact very much larger than the next smaller group, but that the particular manufacturers carried much larger stocks (sometimes in a separate warehouse not itself included in the policy) and so their total cover was larger. Their

machinery cover however was the same percentage as for the smaller group. In the event it is likely that as the figures for the two top groups were derived from only five mills each, they were not entirely representative. As noted in the groupings of costs, buildings, machinery, utensils and stock, the machinery accounted for the smallest amount of capital investment. The position changed with the introduction of the paper-making machine, steam engines and other mechanisation after the first quarter of the nineteenth century. It is regretted that insurance policies for this period were not available for direct comparison, but the matter is dealt with from other sources in chapter six.

Reverting to the idea of establishing a paper mill in an existing mill, it may be reckoned that if an entrepreneur with enough capital to set up a small mill were able to devote his money to utensils and a reduced amount of machinery only, then he might achieve a medium sized establishment. Similarly, if he were originally contemplating a medium sized mill, relieved of the building costs he might establish a large one. It is not likely, however, that an existing mill could be had for nothing and if not bought at valuation or some similar figure - as in Tullis' purchase of Auchmuty Mill mentioned above - then the mill might be rented. The amounts charged in rent varied between $5\frac{1}{2}\%$ and $7\frac{1}{2}\%$ of the capital. Using a figure of 7% the rental of a small mill when complete would be about £40 p.a. or £14 for the buildings. Such figures agree with some of the records of mill rentals.¹

1. Balfour of Balbirnie documents give instances of $5\frac{1}{2}\%$ and 6% .
Herbertshire documents give $7\frac{1}{2}\%$ and rentals as quoted. In 1855 the rental of Carrongrove was £67 p.a. (S.R.O. Sheriffdom of Stirling Vol. 30 f.15).

An interesting confirmation of several of the points adduced in the foregoing analysis occurs in a recent article by Professor Pollard.¹ In this he emphasises that in the Industrial Revolution fixed capital has often been exaggerated in comparison with circulating capital. Thus as noted, above, the fixed capital of an industry may be low and give the impression of a very low capital to output ratio. Confirming the finding that in the Scottish paper industry the investment in machinery was relatively low, Professor Pollard notes that much of the machinery and equipment of the period was simple and cheap and was not bought outside but was "home-made." Then on the point of credit financing, he notes that wages were paid in arrear. This was of course the case in the paper industry which however had the additional credit facility of not having to pay the excise tax on its output till six weeks after the paper left the mill. This certainly helped many small operators to get started with a minimum of fixed capital. Finally the ratios of fixed capital to stocks quoted in the article vary from 1:5 to 1:8.5 and though the equivalent figures are not available for the paper industry, the increasing amounts covering "stock" in the policies show a bias in this direction also.

The influence of Landlords on mill establishment and development.

On the matter of mill renting, the landowners' attitude had on occasion, considerable effect on the development of the industry. While it is not contended that any special favour was shown to paper, rather than to cotton, linen, wool or bleachfields, the great development on the Clerk lands in the Pennycuik area, from 1708, owed much to Sir John Clerk and his successors.²

1. Pollard S. Fixed capital in the Industrial Revolution in Britain. J. Econ. Hist. Vol. XXIV No. 3 Sept. 1964.

2. S.R.O. Clerk of Pennycuik muniments.

One particular example of Clerk encouragement comes from a document of 1767 dealing with the erection at Auchendinny, without permission, of dam dykes across the Esk, and of fixing one end to Sir John's property.¹ In this document occurs the passage:- "... Sir John Clerk could have interrupted and either obliged the said William Annandale to have removed the same or to have paid a valuable consideration ... Nevertheless In order to encourage him the better to carry on that branch of manufactory of paper making which is so usefull and beneficiall to the country, the said Sir John Clerk ... not only renounces ... every claim ... but obliges him to ... defend ... Wm. Annandale ... in the peaceable possession of the liberty of fixing one end of the dykes on the Lands of Eastfield in all time coming ..." The sentiment here expressed, though by Sir John's lawyer, is almost certainly quite sincere, for Sir John Clerk was one of the original and most active members of the Board of Trustees for Manufactures, was a Baron of Exchequer as well as a mercantilist pamphleteer. He epitomised the new XVIIIth century landowner to whom the economic improvement of the country was a subject close to his heart and his pocket. He can truly be said to have been an "improving laird" to whom the word "improvement" had wide; connotations embracing industry and industrial development as well as the perhaps better known agricultural improvements. There was of course personal benefit but there was a strong patriotic strain in the enthusiasm and developments.

A view similar to this was expressed by Carter Goodrich writing on the financing of canal construction.² This, he says, "... was influenced by motives

1 Ibid no 1328

2 Goodrich C. Canals and American Economic Development
New York 1961, p.251.

of public spirit as well as of individual and group interest ... and the very term 'improvement' carried with it implications of enlightenment and progress similar to those now conveyed by the phrase 'economic development'..."

Examples of sponsored development occurred at Urr in Kirkcudbright on the estate of Alexander Copland of King's Grange, in collaboration with George Maxwell of Munflies. The village of Dalbeattie was established about 1780 with the setting up of woollen, then cotton and subsequently of paper manufacture.¹ This pattern of the initial establishment of industries including linen or cotton also occurred at Salton on the Fletcher estate in East Lothian. In this case a barley mill was established in 1720 - the first in Scotland - and later linen and bleaching were introduced. The date for this has not been determined but it was certainly before 1760.² By 1773 a paper mill was in operation³ and this continued till at least 1825. In both the Dalbeattie and Salton instances it may well be that the existence of a textile production unit (however small) provided a source of raw materials for the production of paper. Such raw material (mill waste) was used to a considerable extent by the Tullis partnership at Auchmuty.⁴ At about the same time, the Herbertshire estate, near Denny, was developed by its owner, William Morehead. Following the establishment of the Carron Iron Company, which, feued part of its lands from Herbertshire, William Morehead started a Bleachfield and in 1788 built the Herbertshire paper mill. In this case, Morehead

1. Chalmer's Caledonia Vol. V, p.297 & OSA Vol. XI, p. 75.

2. Caledonian Mercury 11 April 1760 carries an advertisement for the bleachfield.

3. See Armstrong's map, November 1773.

4. Tullis Russell documents.

was always willing to erect further buildings for new tenants, and even to advance money for capital expenditure - always adding, however, $7\frac{1}{2}\%$ of his outlay to the rent he charged. He also allowed Charles Laing (1801) to erect a new water wheel and in 1806, another mill.¹ The matter of the ownership of such improvements and of the relative wisdom of the policies of low rental with permission to improve, or of an economic rental for the mill with all improvements by the landlord, was one of considerable importance. In the case of the Balbirnie mill in Fife, there are recorded discussions of the wisdom of keeping the mill subservient to the proprietor's coal interests, of the quasi-sale nature of a very long lease and of the unlikelihood of any tenant spending a large sum if granted only a short lease. It was strongly felt to be better for the landlord to do the improvements and to retain control.² The mills at Balbirnie and at Herbertshire are still in operation, showing that the policies adopted were not inimical to their continued operation and even expansion.

An example of tenants' unwillingness to enter upon any extensive programme of improvement or enlargement - or even to maintain the mill in first-class order - occurred at the Culter Mills (Aberdeen). The original lease, granted on 9th January, 1750, was for 114 years (6 x 19) at sixty pounds Scots or £5 sterling p.a.

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1. Herbertshire documents. After spending some £400 between 1788 and 1789 for James Liddel, the first tenant, for the next tenant, David Macdonald (Nov. 1790) Morehead (proprietor) agreed to supply "a set of felts and frames, a wync and scales and weights." For Richard Collins (1791) he built a dwelling house, an additional dryhouse and advanced £100 for more machinery. Strachan Laing (1795), however, himself made "additions and improvements."
 2. Balfour of Balbirnie documents.

In 1826 a further piece of land for building cottages was let for 38 years at £5 p.a. and a passage to a dam dyke was let for a further £1 p.a. All work was to be paid for by the tenant and was to become the property of the proprietor. In 1837 the mill changed hands and little work on the mill was done thereafter. In 1856 (i.e. with only 8 years of the lease to run) there was a further change in ownership and when the lease was renewed after 1864 it was for 19 years at £175 p.a. In the event a new company was floated and the sum estimated "to put the mills in full working order" was £4,000,¹ showing how "run-down" the property had become.

Two examples only have been traced of mills being closed by landlords' action, and both were well after 1861. The lease on Waterton Mill (Aberdeen) was not renewed when it expired in 1882: the mill was dismantled, as the smoke from its chimney was objectionable to the owners, who lived at Waterton House. The mill had one machine.² The second instance was the Newbattle mill which was closed in 1890 as the firm was unable to come to terms with the proprietor for a renewal of the lease. In this case the mill had three machines and employed some 300 persons.³ The work was transferred to the firm's two other mills, but clearly it must have been a blow for the villages of Lothian Bridge and Newbattle.

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1. A.A. Cormack: Paper making on Deeside. The Deeside Field No. 6. 1933. Aberdeen.
 2. W. P. T. R. 18th April, 1913 and Cruickshank, Newhills, The Annals of the Parish, 1934.
 3. A Century of paper making 1820-1920 (Craig documents) Edinburgh 1920.

One instance of disagreement which did occur within the period of this paper was at Bog's Mill, Colinton. In this instance the tenant, John Balfour, who had carried on since 1762, when his partnership with Gavin Hamilton was dissolved, wished to enlarge his residence, Millbank House. The reason for this was said to be to provide adequate accommodation for the Bank officials, who came and resided at the mill while any banknote paper was being made. The landlord, George Inglis of Auchendinny and Redhall, raised an action in the Court of Session to prevent Balfour from adding to Millbank House. In the end the judgment went in favour of Inglis, and Balfour in 1783 leased a waulk mill from a neighbouring proprietor, Sir James Foulis, and converted it to paper with the name Kate's Mill after Katherine Cant, John Balfour's wife. The episode of the Court of Session does not seem to have embittered relations, for Balfour retained Bog's Mill till the expiry of the original 57 year lease (granted to Gavin Hamilton) in 1813. Moreover, George Inglis bought Kate's Mill from Sir John Foulis in 1799, and Balfour continued as tenant there till, it is said, 1859, though in 1831 Cowan's seem to have had at least an interest in the place.¹ However, it would seem that at least in the period to 1861 the landowners' policy was helpful towards the paper industry. Rentals were not exorbitant nor was permission to expand the premises usually withheld.

Sources of Capital.

Consideration will now be given to the sources of the capital required to

1. Cowan documents. Wages and other books.

AT EDINBURGH,

the 20th Day of November 1694.

NICOLAS DUPIN Esq; late Deputy Governour of the Paper and Linen Manufactures in England, Scotland and Ireland, and Denis Manes Esq; Do hereby Certifie, that the Right Honourable George Lord Brouncker is interested in 500 Shares in the General Joint Stock of the Paper-Manufacture in Scotland, and is accordingly entred in the Companies Subscription-Books at Edinburgh, In Testimony whereof, the said Nicolas Dupin and Denis Manes have hereunto Subscribed their Hands and Seals, the Day and Year first above written.

Witness

Robt Henderson
Jas Henderson

Nicolas Dupin
Manes

Memorandum, the three Pound Sterling per each share by the Articles; is to be paid at three several even and equal Payments, to the Treasurer of the White-paper Company for the time being at Edinburgh, as follows, That is to say,

The sum of one Pound Sterling, being the first Payment, is to be paid on the first Day of May next ensuing the Date hereof, or within seven days then next following, Anno Dom. 1695.

The like sum of one Pound Sterling more, being the second Payment, is to be paid on the first Day of November then following, or within seven days then next after.

And the like sum of one Pound Sterling more, being the third and last Payment, is to be paid on the first day of May then next following, or within seven days then next after, which will be in the Year of Our Lord 1696.

Nota, The Treasurer is to give his Receipt for each Sum he Receives from the Subscribers.

set up or rent and convert a mill. Of the very earliest mills little is known, but for two of them, that at Braid and that at Yester (both about 1695) information exists on the amount of capital raised. These were both operated by the Scots Whyte Paper Company, which was a large enough concern to have a separate warehouse in the Grassmarket at least by 1699.¹ The capital raised by the Company was £5,000 in shares of £3 each and this sum was to be paid in three six-monthly instalments, on the 1st May 1695, 1st November 1695, and 1st May 1696.² The mill at Yester was certainly still in production, though under different ownership, in October 1731 when paper was made there for the Royal Bank of Scotland³ and it continued till 1774.⁴ The Braid mill was in production in April 1713. Peter Spence was Tacksman of the mill at his death in 1714.⁵ Little is known of the duration of operations of this Company. Strangely this seems to have been not only the first, but the only Company deriving its capital from the public sale of its shares which existed in the paper industry in Scotland in the period under review.

The "Society of the White writing and printing paper manufactory of Scotland" which was established in 1694 was, as far as can be discovered, the sixth Company owing its origin to the genius, drive and financial acumen of Nicholas Dupin. This man first appears in a list of Frenchmen who instructed

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1. Edinburgh Gazette No. 7 20th March 1699.
 2. Cromartie Misc. Papers, bundle XLVII. Certificate for twelve shares bought by the Rt. Hon. George Lord Viscount of Tarbot.
 3. Royal Bank of Scotland, Charges of Management Book.
 4. Caledonian Mercury Saturday 4th June 1774.
 5. S.R.O. Edinburgh Commissariat 23 Nov. 1714, will of Peter Spence merchant and Tacksman of paper mills at Braid and Yester ..."

John Briscoe in the secrets of the (paper) trade.¹ In 1685 a patent was granted and The Governor and Company of the White Paper Makers in England was set up. Nicholas Dupin was one of the members of this Company. After this, he seems to have been the moving spirit in the setting up of a further six Companies. These were Irish paper 1690, English linen 1690, Irish linen 1691, Scots linen 1693, Scots paper 1694 and Scots mining 1695.² In all cases Dupin himself received some financial consideration. In the case of the Scots White Paper Manufactory the first shares were offered at £3 but a second issue, in 1695, cost £4 and the sum of 18/- (sterling) "subscription money" was to be paid to Dupin at the time of application.³ It is not clear if this sum was payable "per share" or "per application", but Dupin was the recipient. In the Irish linen venture, Dupin received 100 shares at £5 each and though there was a dispute over this with the English Linen Company, (as Dupin was a member of the "parent" Company) the principle seems to have been upheld that Dupin, as promoter, was entitled to "subscription money" in one form or another as a reward for his endeavours.

It is also interesting to note two further facts in connection with these Companies. Firstly, Dupin's initial offer of shares was sometimes at a lower rate than his subsequent offer of further shares. Thus the original shares in English linen were £10 but the second issue were £50; in Scottish paper, the first issue was £3 and the second £4. English paper was, however, £50 and £50.

1. Scott W. R. Joint Stock Companies to 1720. Vol. III p.64.
2. Ibid pp. 71, 90, 92, 95, 101 and 167.
3. Ibid p. 182.

The purpose of this practice was no doubt to raise a certain, if small, amount of capital quickly. With this, some preliminary building or leasing operations could be financed and on the strength of these, the second issue could be floated. The second point of note reflects on the relative economic state of Scotland at the time. This, as was pointed out in the introductory chapter, was poor compared with that of England. The share prices of £50 (English paper and second English linen), £10 (English linen) and £5 (Irish linen), contrast strongly with Scots paper £3 and £4 and underline the shortage of capital in the northern kingdom. This man, Nicolas Dupin, then was clearly an unusual and successful company promoter. He was French and most probably had some technical knowledge of the paper industry. He may too have seen in the linen industry not only a change of developing a new and rising commodity, but also a means of encouraging supplies, which from off-cuts, waste and subsequently rags would assist in his paper projects. His success meant much to the Scottish paper industry in the early days and it is perhaps strange that his method of raising money by a Company with publicly subscribed money, was not, as far as can be found, repeated in over 150 years. Several so-called "Companies" do, however, occur in the records, e.g. The Polton Paper Mills Company (c 1769-1774), The Balerno (Paper ?) Company (i.e. Nisbet and McNiven 1788-1799), The Broomhouse Paper Mill Company (1799 - c. 1830), George Laing and Company (1828-1843). None of these, however, - nor or others

not listed here, was other than a co-partnery. It seems that the main method of raising capital for the Scots paper industry was by partnerships. These sometimes had as many as six partners, but of the larger continuing concerns, family establishment played a large and important part. Thus the Collins family of Dalmuir was in continuous control of the mills from 1746 right through the period under review. During this time, one or other of the Collins entered into partnerships, but no business failure occurred to necessitate selling either the business or its control. The Smiths of Peterculter ran that concern from 1750=1819 when it was offered for sale; the Robertsons of Midcalder have lasted since 1761. Other well-known names that carried on as family concerns or companies from the XVIIIth Century are Pirie (Stoneywood) since 1778 and Cowans (Valleyfield) from a year later. The same pattern was continued into the XIXth Century with the Martins in Berwickshire 1801 (though this was but a branch of the family dating from c.1725 at Penistone), the Tullises of Auchmuty and Rothes 1804 and the Craigs at Newbattle, Moffat and Caldercruix 1820. Many of the other concerns were two-man partnerships, usually with one of the partners being concerned with the papermaking and bringing some capital to the enterprise, but the other having mainly a financial interest. Another feature seems to have been the granting of partner status, on a small scale, to the mill manager, who was of course primarily responsible for the technical aspects of the business.¹ Yet another type of partnership was that in

1. Auchmuty Alex Grieve £70 p.a. and a partner, 1809.
Kinleith Robt. Walker £1/5/- p.w. and a partner, 1792.
Springfield Robt. Cameron £70 p.a. and a $\frac{1}{2}$ share partner, 1798.

which money was provided by a paper manufacturer to finance another, smaller concern. This was done by Alex. Cowan who put up £1,000 to George Laing's £500 in a firm which traded as George Laing & Co.¹ The mill was at Balerno, and Laing received a salary for running the mill. This may of course have been simply a case of Laing obtaining a partner who happened to be a paper manufacturer.

One further feature of the Scottish paper industry's financial methods was the operation of more than one concern by the same owner. In some early instances this may have been to ensure continuity of supplies, but normally it seems to have been a simple case of expansion when an opportunity occurred. However, it may have been but an extension of the principle by which the paper making itself was undertaken by printers and publishers. Examples of this occur throughout the period, one of the earliest being Richard Watkins at Valleyfield (1717) and at Yester (1723) while the consortium of Walter Ruddiman (Caledonian Mercury), Robert Fleming (Edinburgh Courant) and John Aiken (Bookseller) whose interests in Springfield, Melville and Redhall Mills perhaps deserved a longer run than their 34 years, from 1742-1776. Many other examples exist² to show that there was considerable attraction to the idea of setting up

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1. Balerno George Laing £110 p.a. and a $\frac{1}{3}$ partner, 1828.
 2. Robt. Weir Stationer & proprietor of Cathcart, Stoneywood (Denny) and Carrongrove.
Alex. Brown Bookseller, James (?) Chalmers Aberdeen Journal,
Ferryhill Mill.
Robt. Tullis Bookseller & Publisher Cupar and proprietor Auchmuty
and Rothes mills.
Robt. Taylor Bookseller Berwick and proprietor Broomhouse Mill.

paper mills in Scotland. This country, as Sir Wm. Forbes said, "never supported itself with paper either for writing or printing, but every year imported a very considerable amount, all of which would be saved to the country and at the same time a considerable profit accrue to the undertakers as labour was much cheaper in Scotland than in England."¹ This Company, The Polton Paper Mill Company, was started not by a printing, publishing and bookselling interest, but by the two finance houses, Arbuthnot and Guthrie and Forbes Hunter & Company. Its failure cannot be attributed to a lack of capital on the part of the promoters, though it may well be that had it continued for a few years longer and had more of the capital made available at the mill, it might have been a success. As it was, it added to the depression following the failure of the Ayr Bank and other concerns around 1772. It seems certain that the general instability which arose, following the Ayr Bank failure, was a major, if not the prime, cause of the mill closure. It seems from what Sir Wm. Forbes says, that on the failure of their associates Arbuthnot and Guthrie, they took the opportunity of closing the concern. One further class of financiers concerned in the paper industry was that of lawyers or writers. In their way of business they would of course be dealing with properties and when no offers were received might well accommodate

1. Forbes, Sir Wm.: Memoirs of a Banking House.

their clients. Several examples of such lawyers' dealings have been noted,¹ but it is doubtful if this constitutes a trend in the business.

On the whole it seems that the main methods of financing the Scottish paper industry were four in number. Firstly, using money derived from some cognate business such as printing, publishing or bookselling. This enabled supplies of paper for the original business to be guaranteed and was a small early example of vertical combination. Secondly, and frequently in combination with the foregoing, a co-partnery was arranged, either to increase the amount of capital available, or to spread the load to avoid taking too much from one business. Thirdly, and this can be considered as a variant of the above, the co-partnery might be dominated by, if not exclusive to, the family.² In this case, however, as some members of the family were brought into the business, the purpose would be to keep the project in the family rather than to raise funds. Fourthly, and though on a financially smaller scale the numbers were not insignificant, came the individuals who

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1. Valleyfield bought in 1767 by David Erskine and assigned and sold to Chas. Cowan in 1779.
Springfield bought in 1787 by Francis Strachan.
Herbertshire leased in 1795 by Francis Strachan till 1797.
Culter Mills bought in 1819 by John Ewing and sold again in 1821.
 2. Chas. Cowan 1779 + Duncan 1795 + Alexander 1796(?) + Charles 1824 + Others 1838.
Alex. Pirie 1796 + Francis 1836 + Alexander 1839.
Edward Collins 1747 + Richard c. 1780 + James & Edward III 1820 + Joshua 1841 + Edward IV 1851 + Edward V 1872 + Charles 1894.
Robt. Tullis 1809 + William 1829 + Robert II 1836(?) + Robert III 1872.

rented and operated small one vat mills. Such men, while not being men of straw, were nevertheless vulnerable to trade recessions, to mechanical failures, to fire losses and to the slow-moving finance of the bill. At the end of the six week grace period the excise payment often caused embarrassment if not disaster. Several of these hazards were of course common to all operators, but if one had only a single vat, an accident to this would cause not a reduction of output, but shutdown.¹

Changes of ownership, failures.

From the records of mill operators, these seem to have changed more frequently in the small mills than in the larger. Though it does not follow that such changes were always the result of financial failure, it seems likely that when the time intervals were short this may well have been the case. In the Herbertshire mill, the failure rate was very high in the early days for there were six tenants between 1789 and 1801.² In the case of the Valleyfield mill, Pennycuik, however, although there were 10 operators between 1708 and 1802, no instance of failure has been noted. Failures were not particularly widely publicised as news, and in general such information was not mentioned in advertisements of mills for sale. In the history of Springfield mill near Polton, started in 1742, there was a failure in 1776. When the mill was advertised for sale in 1777, in this case intimation of the failure was given

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1. Esk Mills Letter Book 3rd March 1808 "... by the accident of my water wheel ... all orders on hand have been delayed ..." 9th March 1808 "... I cannot say when it may be in my power to make..."
 2. Herbertshire documents - tenants James Liddell 1789, Daniel Macdonald 1790, Edward & Richard Collins 1791, Strachan Laing 1795, Adam Grieve 1797, Charles Laing 1801.

"... Such as have any claim on Robert Fleming ... will as soon as possible give ... exact notes thereof ..."¹ From 1787 till 1856 there seem to have been seven owners, none of whom failed, though failures subsequently occurred in 1856 and again in 1863. At the time of the sequestration in 1856 the mill had 14 beaters, a number exceeded only by Valleyfield, with 21, so the cause of the failure was certainly not lack of expansion. There may well have been too much for the contemporary market. Another early failure was also at Polton. This mill, with five vats in 1767 or 1768 was of considerable size but it failed in 1772, having, according to one of its backers, "...carried on for about three years without doing any good."² The same source attempts to analyse the causes of the failure. The "technical" man, Fraser, had been manager of "a small paper mill belonging to Adrian Watkins."³ It was felt that he had been carried away with his own enthusiasm and that the five vat mill built was much too ambitious. Two different English overseers engaged for the mill had died on the way north and so Fraser had become the manager. It was also contended that the manufacture "was conducted at too much expense" and that the paper was of an inferior quality. Sir Wm. Forbes also says that originally the mill

1. Edinburgh Advertiser 10th October, 1777.

2. Sir Wm. Forbes: Memoirs of a Banking House. Ed. 1859.

3. This was Valleyfield and up to 1766 it may have been a two vat concern, but it was enlarged shortly after this and sold for £1,300 in 1767 a price more in accord with a four vat mill.

was to have been erected by Mr. Guthrie and Mr. Hunter at their own expense and that the running only was to have been by a co-partnery of the two banking houses of Arbuthnot & Guthrie and Forbes Hunter & Co, However, they had to pay for the buildings as well, and when Arbuthnot & Guthrie became bankrupt in 1772 that "put an end to the concern and left the whole loss on Forbes Hunter's shoulders ... and we gladly availed ourselves of the opportunity of bringing it to a close." The onus of the failure seems to have been put on Fraser. This may have been rather hard on him, for as manager to Watkins he would have had reasonable knowledge of the skill required and originally had intended having a manager from England. As to the quality of the paper being poor, it is reported that in c. 1768 the paper for the British Linen Bank notes was made at Polton Mill¹, so that although this would certainly not be the whole output, the ability to make such paper at all indicates an unusually high degree of skill. The speed with which the enterprise was closed down after 1772 seems to show a certain lack of zeal on the part of Forbes Hunter & Co. and especially of Sir William Forbes himself. It may well be that the failure was in large measure due to a shortage of liquid capital at the mill. Three years, in ordinary circumstances, should have been long enough for the mill to show a profit, but the times were not ordinary; they were depressed but with some greater interest and support by the principals,

1. Information from R. Waterston, Edinburgh.

the mill might have continued and been successful instead of being sold for less than a third of its original cost, to Wm. Simpson, it is thought.

Another 18th century failure which is surprising, was that of Edward Collins at Herbertshire (Denny) in 1795. After some correspondence with his brother Richard who successfully ran Dalmuir, Edward, or Richard and Edward apparently entered into an agreement to rent the mill. This was for 57 years at £50 p.a. plus $7\frac{1}{2}\%$ on the money laid out in building a workhouse, with a dryhouse over it and a dwelling house and offices. He was to receive an advance of £100 "for alterations and additions to the mill and to add another engine." This he certainly seems to have done, according to inventories and he repaid the £100 by 9th December, 1791. However, thereafter he got badly into arrears with rent. Richard is said to have agreed to grant bills for the arrears in July or August 1794. These were not, in the event, forthcoming and Edward was sequestered. His effects fetched £87/16/7 $\frac{1}{2}$. Of this £30/12/8 $\frac{1}{2}$ was due for excise and £17/5/- was claimed as for landlord's property, leaving only £33/8/7 against the rents due, which amounted to £325. It is not clear if this was ever paid, but a summons was served on Richard at Dalmuir in August or September 1797.¹ In this case the mill would seem to have been in good order with new workhouse, dryhouse, office, dwelling, new engine and "additions". The rent was no doubt high, for the cost of the workhouse etc. came to £639/16/- on which $7\frac{1}{2}\%$ comes to just on £48, so that the

1. Herbertshire documents.

total was £98, plus what had to be allowed the previous tenant of the ground on which the house, etc. were built. (The next mill tenant was charged £85). As far as technical knowledge was concerned, brother Richard at Dalmuir was certainly in a position to help, for in 1793 there were 84 employees at Dalmuir, showing that mill to have been a considerable undertaking. In the early stages Richard was associated with Edward in the negotiations. It may be, however, that he was not helpful, for in the Dalmuir records no mention has been found of this Edward.¹ The amount due to the excise of £30/12/8¹/₂ may conservatively be assumed to have been the amount outstanding for perhaps six out of the full twelve week period, since the previous visit of the exciseman. Taking then the total Scottish output for 1794 and the excise collected for that year, an estimate of Collins' output for the six weeks can be made, since the tax was approximately 1³/₄ per lb. On this basis his output was about 6 reams per day: a figure reasonable but not good for a one vat mill: for a two vat concern it was worse than poor.² Possibly winter conditions

1. Edward Collins & Sons documents.

2. In the "Instructions for ... officers of Excise in Scotland" to assist the officers in estimating the quantity of paper made at mills, are given the reams of each sort usually made in a day. The list (see Appendix) has 21 sorts of paper and of those, only seven expect 6 reams or less per day. These are the three Royals (Sugar, Writing and Printing) the two Mediums (Writing and Printing), Cartridge and Elephant. In a Herbertshire inventory of 1797 are mentioned Double Grace, Small Brown and Large Brown (moulds) and old felts in Crown size. These sizes do not seem to conform to any of the seven mentioned. This confirms the view that 6 reams per day was a low output. Moreover if the figure due to the Excise covered more than half the period (i.e. 6 weeks) the output would have been even poorer.

helped to reduce output, but even so it does not seem that the mill was destitute. It was probably the rent of nearly £2 per week which caused the failure, as this item itself would require an output of at least 4 reams per day, and if his output was in fact only 6 reams, then it would seem that with such a rent he simply could not survive on one vat. It is not known for certain why the output was so low; it may simply have been that the paper was poor, or it may be that from incompetence much of the machinery was allowed to fall quickly into disrepair. There is also good evidence that the mill wheel was inadequate, with the water available, to the task of driving constantly the two beaters. The next tenant was Francis Strachan of Springfield Mill, Polton, and before taking over Herbertshire Mill he reported most unfavourably on its condition. In subsequent correspondence he gave his output from July 1795 to November 1796 as "only 3002 reams, whereas a two-vatted mill should make 5724 reams." These figures correspond to an actual output of about 8 reams per day and to an anticipated figure of 15. Moreover he says that "when we agreed on a rent of £85 ... we agreed ... that £200 would put the mill to work and our outlay would not exceed £1,000, ... in place of which I have £2,000 ... sunk in the work and Francis Strachan Jr. has £700 to £800."¹ Thus it certainly seems that Edward Collins allowed the mill to run down considerably in his three years. Another major consideration in Collins' failure, however, must have been the water supply to the wheel. Further correspondence from Gilbert Laing (Strachan's partner) complained that "... in summer the water would scarcely drive one engine ... in winter it

1. Herbertshire documents.

was seldom that both could be worked ... (even) after raising the dam three and a half feet, ... and bringing the water to the centre of the wheel instead of below the centre ... and substituting the great additional power of close buckets ... in place of open float boards." So that it seems clear that in Collins' time the mill was not capable of driving the second engine which he installed and this fact made it impossible for him to sustain an output adequate to cover his rent and operating expenses. It seems less clear why Richard Collins did not realise this, as Dalnair, a two vat mill, was itself built in 1747 because of the inadequacy of the water supply at Balgray, where his father had originally started in 1746.

Another cause of failure was fire. This was always a danger in the paper mill for though the drive in the early days was always by water wheel, there was heating of the vat,¹ sometimes by small open fire and later in the XVIIIth century there were flues and stoves for drying. In addition there were usually dwelling houses near or adjacent and a chimney on fire could easily start a mill fire where much of the stock was highly combustible. A quite considerable part of the mill at Tongland was destroyed by fire in April 1772. A contemporary advertisement says "... the roof ... with part of the flooring etc. was burnt ..." but the mill was not completely destroyed for the advertisement continued "... Also all the machinery and compleat glazemill, large Dry-house..."²

1. See ch. 2 p.67.

2. Newcastle Journal, 30 May 1772.

One other instance of fire loss was the mill known as Ayton Millbank. This was completely destroyed in 1861 and the owner, William Martin, who had allowed the insurance to lapse, became manager of an Irish mill for a number of years before returning to Ayton Bleachfield¹ Mill.

In a consideration of the causes of mill failure, the size of the undertaking does not seem to have been a factor. Quite small, medium sized and large mills all had to close down. Mechanical breakdown, whether due to accident or to the water supply failing to turn the machinery was a potent factor in some failures. The water hazard was usually seasonal, that is, low water in the summer, when drying conditions could be expected to be good, followed by adequate water in winter, when drying would be difficult. Such a cycle would make it difficult to sustain output and fulfil orders.

A second cause was lack of adequate liquid capital. Such seems to have been the case in the Polton Mill quoted above and in the cases of the one vat tenant-mills. Such men seldom had the resources to tide them over prolonged periods of low or zero output, whether due to accident or weather. An instance where there does seem to have been adequate liquid capital and accommodation was at Esk Mills, Pennycuik.² From the mill correspondence we learn that in September 1807 there was "... a flood which has damaged every paper mill in the neighbourhood..." and from then

1. Information from the Martin family, Bleachfield, Ayton.

2. Esk Mills documents.

on to the end of the year there were letters to various creditors "seeking their indulgence" on some accounts. Late in December there was an accident to the water wheel axle. In February, the owner wrote "... By the accident of my water wheel having given way I have had no work for two months in the fine mill ...". In march, "... I cannot say when it may be in my power to make any (Demy paper) as that will depend on my getting to work again ...". At the end of March payment was made for the new axle by a 6 months' bill of exchange and paper shipments again appear. Thus for some three months following trouble caused by flooding, there was no output from the mill - but it survived and the computed receipts were £4,121 for 1807: in 1808 the drop to £3,950 - with survival - must in the circumstances have been felt to be very satisfactory. The ability to carry on when there was no production must have arisen from adequate liquid capital and sufficient known stability to merit temporary "accommodation" by creditors.

Loss by fire has already been mentioned as another cause of failure, though about half the mills seem to have carried insurance. It must be remembered, however, that such insurances as have been examined covered only the capital value of the mill and its contents for replacement purposes. A quite small fire could put a mill out of production for a long period while the replacement of machinery was undertaken. Thus again the main difficulty would be one of maintaining existence in a period of low or zero output. Although, as was the case at Esk Mills mentioned above, the owner

might pay with a six months' bill, this implied the other party's willingness to accept such a bill and of course there would be other, previous bills falling due for payment during the "idle" period. In due course too the Excise "credit period" would expire and add to the demands for cash. This again emphasises the need for reserve liquid capital in the industry. It might not be too much to say that whatever the initial cause of difficulty, whether high rent, interest or other overheads, mechanical failure by accident, low output due to vagaries of the water supply or temporary stoppage due to fire, the lack of adequate liquid capital to keep the business going was the most important factor, absolutely crucial to sustained success.

The Returns from Papermaking.

The final aspect of finance to be considered is the returns or profits of the firms which survived. One return from the industry was to Government from the excise collection. As the incidence of this tax varied with the fiscal needs of Government the raw figures do not give an accurate reflection of the increase in size of the industry. Here, however, the matter under consideration is the revenue to Government. For the eight decades from 1781 to 1860 the average annual income from the excise is shown in the table. In the 40 years, 1780-1820, Government gathered just on £1 million pounds in revenue from the Scottish paper industry,¹ and over the whole period of the excise the amount gathered was just on 7¹/₄ million pounds.

1 S.R.O.

Period	Average Excise per annum.
1781-1790	£2,680
1791-1800	£14,056
1801-1810	£36,149
1811-1820	£47,761
1821-1830	£78,536
1831-1840	£109,511
1841-1850	£147,675
1851-1860	£260,203

Average annual excise receipts 1781 - 1860.

Private firms have been less assiduous in preserving their records but there have been survivals with firms, in court cases and in private papers. Messrs. Nisbet and McNiven's enterprise which, as mentioned above, was a six-vat mill and cost £4,200 to erect,¹ made an average profit of £511 p.a. for each of the years 1791 and 1792.² Certainly the enterprise subsequently failed but in these two years for which figures are available the profit was just over 12⁰/₀ of the capital invested. This is on the assumption that no major additions had been made. In the case of the Herbertshire mill, although the owner was himself content with a nominal return of 7¹/₂⁰/₀ on his outlay, this did not represent the full value of the mill and its equipment.

1. See p117 above.

2. Old Session Papers. 206 No. 8.

This arises from the fact that tenants' additions became the property of the landlord and in Collins' case there were several additions including a machine paid for from a landlord's loan of £100 which was subsequently repaid in full and did not therefore earn $7\frac{1}{2}\%$. At a conservative estimate, from seventythree receipts and a priced inventory, the capital value of the mill in 1797 was about £1,500. In October of that year a letter presumed to be from the landlord's lawyer to the new tenant says, "... I hope under your management the profits may at least be from £300 to £400 per annum after paying all expenses whatever ...". This, on the £1,500 would have meant 20 to 25% which is high, was not attained but was suggested by the seller! If 12 to 15% had been his figure this would have brought in £180 - £225 and would still have pleased the tenant had it happened. Here again then one may assume that 12% of the capital investment would be a reasonable profit.

Though of considerably later date, a series of figures is available for the Esk Mills at Pennycuik. The average profit for the nine and a half years from 1846 to 1856 was £3,370 p.a. During this period the capital varied from £16,478 to as much as £37,210 due to borrowings for expansion but the mean value was £24,961. On this sum the average profits represent a percentage of 13.5 which is again of the same order. The profit to the successful operators was from 12 to 15% of their own mill capital. If the total sums are relatively small it would nevertheless seem that the industry as a whole was profitable and played an important part in the economy of the country, since its output reflects, to a considerable degree the economic and social development of the country itself. A similar conclusion was drawn by the writer of a pamphlet on the present day paper industry.¹

1. The Economic state of the Paper & Board Industry, London, 1962. pp.15, 16.

The Geographical Distribution

The factors concerned

In analysing the geographical distribution of paper mills, three main and two subsidiary factors must be considered. A plentiful supply of fresh running water, a good market for the paper and a ready supply of raw materials were the main requirements. Also affecting the choice of site were the availability of suitable labour and the existence of adequate transport.

A plentiful supply of running water was of course necessary for any mill and so, many suitable sites were occupied by corn or other mills. In some instances paper mills were conversions from such mills and they sometimes reverted to their original use.¹ There was however one respect in which the paper mill differed from many of the other mills: it required a considerable quantity of water for process work, over and above what was needed for power to turn the machinery. Moreover, if possible, the paper maker liked to have

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- 1 (a) The Dalry paper mill of Alexander Daes and his partners had reverted to corn by 1699. Edinburgh Gazette No. 19, 27 April - 1 May 1699 Advt. "...to let...Dalry Mills, three corn mills, kilns, garner house, yards and dovecote with the dwelling house... ."
- (b) Gordon's Mills Aberdeen was changed to wool after Patrick Sandiland's venture. Cormack Alexander, Our Ancient and Honourable Craft.
- (c) Edinburgh Advertiser 3 Aug. 1810 p.75 Col. 2 Advt. "Paper mill to be sold... the mills may at small expense be converted into a Distillery, spinning mills for either cotton, wool or flax, corn or barley mills or to any other purpose where water machinery is required"
- (d) O.S.P. 265.24 Low Mill or the Little Paper Mill is the one on the Clerk estate converted from a Waulk mill in 1749 by Mr. Richard Nimmo.

a source of spring water and this was considered essential for the first-grade white papers. Thus we find access to spring water specifically mentioned in the original Braid mill tack of 1695¹ and in that for the Valleyfield mill at Pennicuik in 1708.² Somewhat later, in 1764, and writing in England the Master Paper Makers (a group still in existence in 1792) sent a memorial to the Commissioners of Excise. It concerned the assessment of excise duty on paper measured by the ream and said, in part "... it would be too hard on those mills that made only Second paper, as some, by reason of their situation and want of spring water cannot possibly make Fine ..."³ On this same point of pure water, the writer on Cathcart in the Old Statistical Account (1793) said "... Rapping paper and the coarser kinds of writing paper only." This is attributed to the turbid water in the Cart river.⁴

A ready market would be provided by a large town and it will be found that most of the early mills were established near such towns. As the towns and their economic life developed, they would demand paper for bank notes, for newspapers, for books and for private, business and legal correspondence.

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1. S.R.O. Register of deeds Mackenzie Office 21 June 1698 Lease of the Braid property "...also for conveying and bringing any convenient springs from any adjacent point .. to the said milns ..."
 2. S.R.O. Clerk of Pennicuik Muniments No. 889. Mrs. Agnes Campbell or Anderson acquiring land from Sir John Clerk was "... at liberty to erect a paper miln .. and to take water from St. Mungo's well..."
 3. B.M. Add. MSS. 38203 f 316 quoted by Thos. Balston in "James Whatman father and son" App. 3. p.149.
 4. O.S.A. Vol. V.p.344.

Important industrial uses were the specialised demands of the sugar, grocery, and textile trades. Two early and interesting specialities were wallpaper and papier mâché. In the first year of the excise (1712-1713) 1313 sq. yards of painted (wall) paper were recorded.¹ Evidence of its use in 1727 at the Royal Bank of Scotland occurs in one of the Bank's books.^{1a} An early use of papier mâché was for "stucco" ceiling and wall decoration. Originating in France about 1740 and available in England before 1750² its use in Scotland has been noted at Inveraray Castle in 1773.³

Raw materials for papermaking, particularly in the early days, were available from the towns, where rags were collected and sold, or were collected and bought direct, by the paper maker himself.⁴ When the linen,

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1. S.R.O. Excise Accounts "Quantities of paper-duties payable".
 - 1a Royal Bank of Scotland Charges of Management Book 1727-Jan. 1749 25 =July 1727. "To John Symington for painted paper to the closet in the Director's room 10/1".
 2. Leask A. K. Papier mâché its use as raised paper stucco. The Papermaker Vol. 32 No. 2.
 3. "Sent the Duke of Argyll a design for the ceiling of a room at Inveraray. Procured and sent the papier mâché for the same £5:5:0. Paid carriage 10s. 8d." Quoted in Milne's Master Masons to a King of Scotland. According to Mary Cosh, who is associated with Ian Lindsay on a book on Inveraray, this papier mâché ceiling (of a circular drawing room) may still survive at Inveraray.
 4. Aberdeen Journal. 8 Jan. 1751 "Bartholemew Smith ... buys Rags of all kinds of Flax or Hemp, by the stone weight..." Smith was the proprietor of the mill at Peterculter some 7 miles from Aberdeen.

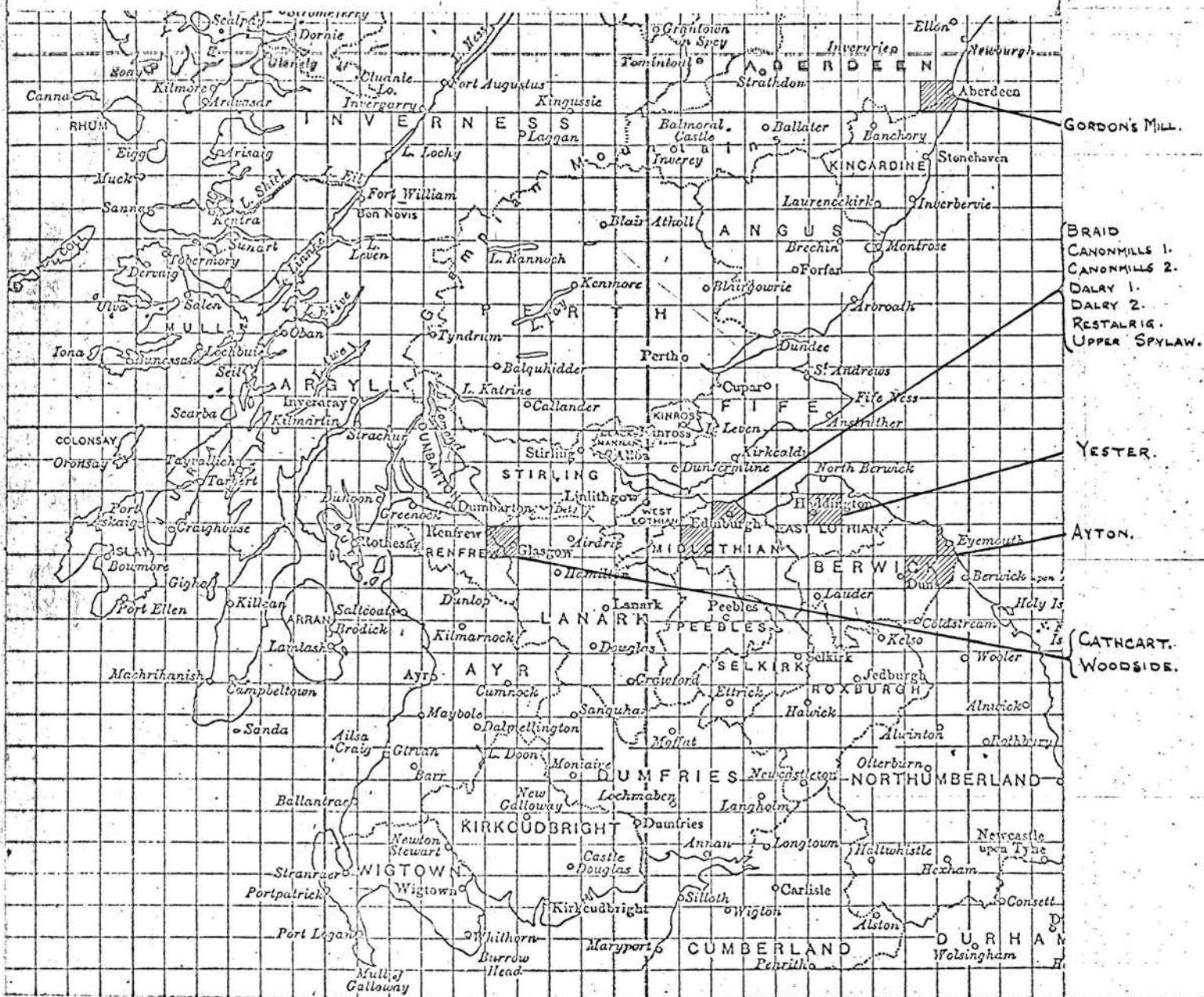
and later the cotton industries developed, their mill waste and off-cuts became a source of raw materials to the paper maker.¹ Several mills were established in the linen-making areas, largely because of this source of raw material - though as will be seen later, imports of rags became essential to supply the increasing needs of the industry.

In the earliest days, the skilled men required were brought from abroad. In Scotland, Dutch, German and French workmen were used, but they taught their skills to Scots.² After the industry was established, skilled men were available in the country itself. The fairly widely scattered incidence of paper mills and the existence of some quite remote mills, lead to the conclusion that local labour was quite able, under instruction, to cope with the techniques of paper making.

Transport was needed to bring the raw materials to the mill and to take the paper to the market. Later, when rags had to be imported from Europe, and when more distant markets, particularly London, were supplied, the East Coast ports became increasingly important because of the cheap sea transport. The position before 1700.

Before 1700, the number of paper mills established in Scotland was twelve. Five of these early mills were in the widely separated areas of Aberdeen,

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1. Tullis Russell's Memo book has several references to the purchase of "mill waste" and of "wet waste" Oct. & Nov. 1842, Jan. & Apr. 1843.
 2. Peter groot Haere was probably Dutch, Peter Seillor, Peter Breush (or Bruce), were Germans. Nicolas Dechamp, Peter de Laney, Nicolas Dupin, Denis Manes were French.



PAPER MILLS STARTED BEFORE 1700.

East Lothian, Berwickshire and Glasgow (with two mills). The remaining seven were all in the Edinburgh area.

The Aberdeenshire establishment was at Gordon's Mills and seems to have been short-lived. The site however has had mills of various sorts for a considerable time. These included a textile mill, malt mill, lint mill, grain mill, and in 1887 it was again turned to paper.¹ The city of Aberdeen as a source both of rags and of custom must surely have been the major factor in the siting of this mill. The founder, Patrick Sandilands of Coton, was a local landowner and would be well aware of the local needs. Unfortunately he was too early in the field to be sustained by Aberdeen. Certainly the town was important in trade in the north, both internally and with exports, but Sandilands' venture was started more than fifty years before Aberdeen's first newspaper was published² or its first bank established.³ With communications as they were, it seems that the local area was unable to support the mill at that time. It is reported that it "... carried on the manufacture of all sorts of paper for several years",⁴ but no closing date has been traced. It was left to a later

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1. 'Gordon's Mills, Miscellaneous deeds.' Messrs. Davidson & Garden, Aberdeen.
 2. Aberdeen Journal No. 1. Tues. Dec. 29 1747 to Tues. Jan. 5 1748.
 3. The Banking Company of Aberdeen 1749 - the first private banking company in Scotland to issue notes. (History Royal Bank of Scotland, Malcolm).
 4. Kennedy, Annals of Aberdeen Vol. 2, p.204. (?) or Gillis WPTR 26 Apr. 1912.

generation of Aberdeen paper makers to establish the area as one of considerable importance in the Scottish industry. As often happens, the pioneer paid a high price for his vision, but, as will be seen later, a further nine mills were established in this area. During the period 1764-1825 the proportion of the total Scottish paper production which was excised in Aberdeen rose to over 12%. These two facts show that this area had good long-term potential in rag supply, in water supply and in markets, though after about 1830 or so, local consumption became relatively less important and the London market became dominant.

The paper mill in East Lothian was one of the two owned and operated by the Scots White Paper Company. It was situated at Giffordhall on the Yester estate. The most likely explanation of the siting is that as the Marquess of Tweeddale was financially interested in the Company,¹ he offered the site. It may well be that to the Marquess, his Giffordhall site on the Coalstoun water seemed both adequate and admirable. It was certainly suitable for making white paper for bank notes both for the Bank of Scotland² and for the Royal

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1. His name heads the list of shareholders as Lord High Commissioner of Scotland.
 2. Malcolm C.A. History of the Bank of Scotland p.256 ... 21 Mar. 1700 notes made at Yester, also in 1721, 1723 and 1729.

Bank of Scotland.¹ This particular mill has a history which extended to eighty years,² but no other mill was established on the same water. The nearest and the only other in the county³ was at Saltoun. It was started a year or so before the last mention of Yester.⁴ This area did not develop in importance in paper making and this was probably due to the very limited water facilities available. It may be that the distance from Edinburgh (20 miles) was a contributory factor, but in view of the remoteness of many successful mills both in Scotland and England, this would not, of itself, have been decisive.

Little is known of the Berwickshire mill. It was situated at Ayton, where other paper mills were later developed, and had as its Master, one, William Hume. As discussed in chapter one, he may have been one of the partners in the second Dalry project (1674-1699 or so). He figures in a list of the shareholders of the Scots White Paper Co. (1694-1702 or 3) and is credited

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1. Royal Bank of Scotland, Charges of Management Book 1727 - Jan. 1749 gives detailed accounts of charges at Giffordhall in making the paper for the Royal Bank. In Nov. 1727 44,400 notes were supplied and in August 1731 24,811 notes were supplied.
 2. The last mention found of the mill was in the Caledonian Mercury Sat. 4th June 1774 "...To let for the remaining five years .. the tack of the paper mill at Gifford..." Previous to this in 1761 Adam Robertson was "paper maker at Gifford." See S.R.O. Particular Records of Sassines, Edinburgh (12 Dec. 1766) Vol. 175, f.181.
Richard Watkins paid the rent of £38 up to Whitsunday 1748.
See S.R.O. Estate accounts and rentals, Barony of Yester 1733-55, Box 4, G.D.28.
 3. William Annandale ran a mill at Beltonford, near Dunbar, after a fire at Auchendinny, from 1863-1892, when it too was destroyed by fire.
 4. The first note of this mill is on Armstrong's map of 1773.

with the production of grey paper. The village of Ayton seems a rather unlikely choice for the site of a paper mill, but Berwick (7 miles) would be its "source town" both for rags and for customers. In the event, the county subsequently had other paper making establishments in it; one of these continues in production to the present time.

In the west there were two mills in existence before 1700. The first of these was established at Woodside near Glasgow in 1683 by Peter Bruce. His partner was James Peddie, merchant, and his ground superior John Campbell of Woodsyde.¹ The mill produced grey and blue paper and at least some was used for making playing cards,² for which Bruce held the monopoly for Scotland. The project lasted till 1686 when Bruce returned to Edinburgh. Though in 1837 another mill at Woodside was started, no further trace of the activities of the original paper mill has been found. The second mill in this area was established by Nicholas de Champ (or des Champs) probably in 1686. In May of that year he had witnessed a document as "Servitor to Peter Bruce"³ and thereafter moved to Cathcart, where he is reported to have married well locally and to have set up a large establishment⁴ as detailed in chapter one.

1. R.P.C.S. Ser. III Vol. X p. 93.

2. Ibid.

3. S.R.O. Register of deeds Dalhousie Office Vol. LXX. p.159. The assorted dates for the arrival of des Champ in Glasgow are discussed in the introductory chapter.

4. O.S.A. Vol. V. p. 344.

Dechamp was an experienced French paper maker, originally brought in for the 1674 Dalry 2 project and who had subsequently helped in the establishment of at least one other mill.¹ The choice of the Cart water was probably because the land came with his wife. Glasgow would of course offer both market and rag supplies, while the relatively heavy paper making activities in the Edinburgh area (to be described presently), may well have encouraged de Champ to move west. The establishment of other mills on the same water confirmed the original choice and the subsequent development of the area will be considered in its proper sequence.

The other seven mills established before 1700 were all in the Edinburgh area. Two of these, at Restalrig (1686) and at Braid (1695) were on waters that never carried any other paper mills. The reason for the choice of the two sites, the one on the river of Tumble and the other on the Braid burn is once more conjectural. In the case of the Restalrig mill it can be assumed that Peter Bruce, the engineer who had run the first piped water supply to Edinburgh,² was fully competent to appraise the capabilities of the stream. In the case of Braid, it may be that Andrew Broun, the owner of the Braid property³ offered the ground where there was already a successful corn mill.

1. James Lithgow's mill at Upper Spylaw, Colinton, see P.C.S. Ser. III, Vol. VII, p. 338.

2. Extracts from the records of the burgh of Edinburgh 1665-1680 p.181 (22nd May, 1671).

3. S.R.O. Register of deeds Mackenzie Office 21 June 1698.

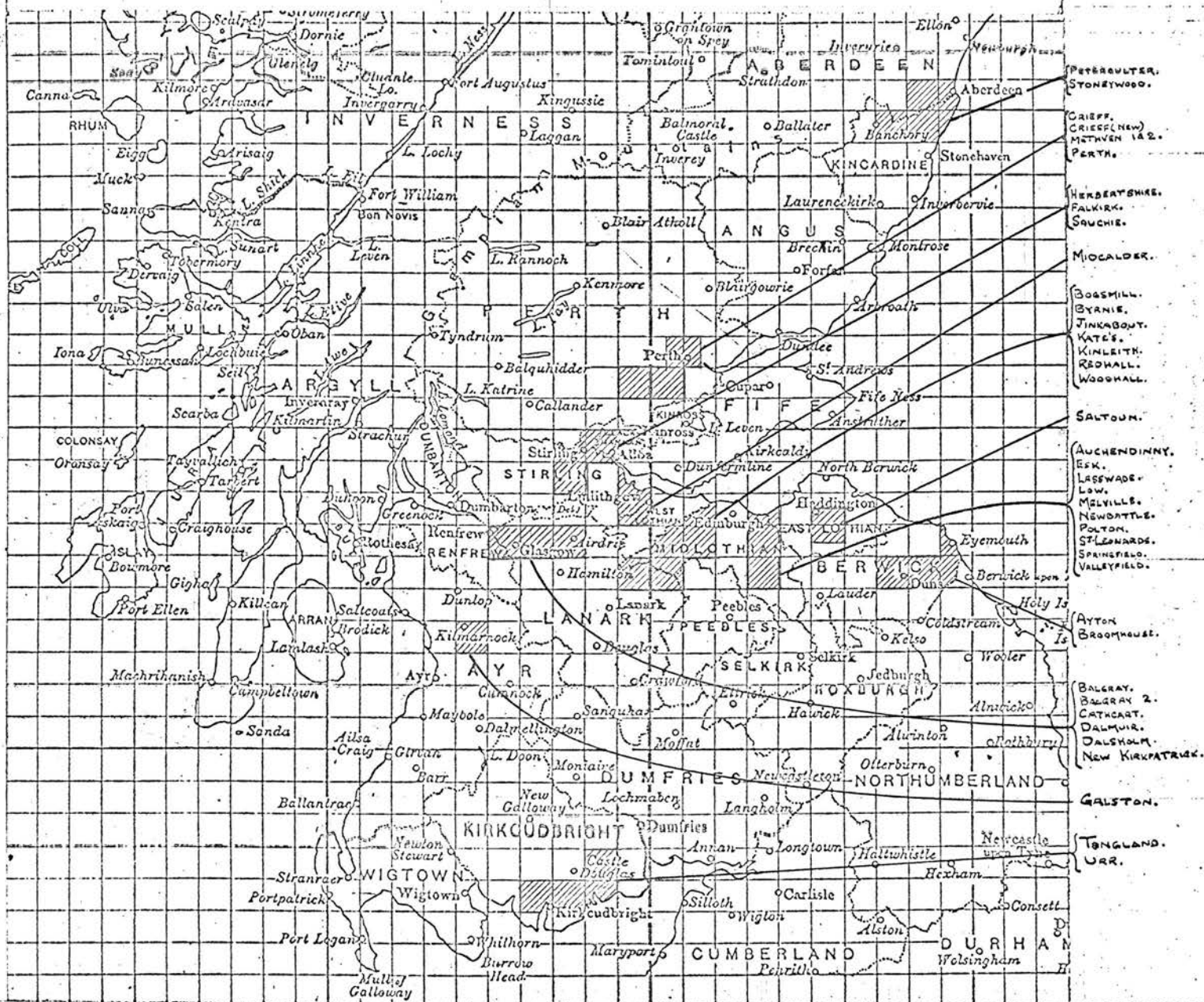
The two mills do not seem to have survived for long. The last we hear of the Restalrig mill is of James Hamilton of Little Earnock taking it over in 1690,¹ just four years after Bruce went there from his Woodside project near Glasgow. The last mention of Braid Mill after some twenty years of existence, is in the testament of Peter Spence. He was the operator of the mill and he died in 1714 leaving an inventory of materials in stock at the mill. It can be presumed to have been a going concern then, for "... unfinished paper and stuff..." are listed in the will.² These short-lived ventures may have indicated that the two waters were, in the long run, inadequate. In any case no more paper mills were operated on either, and the Tumble has been enclosed in underground pipes.

The remaining five mills, Dalry 1 & 2 (1590 and 1674), Canonmills 1 & 2 (1652 and 1658) and Upper Spylaw (1682) were all situated on the Water of Leith. Though there are no paper mills at these sites today, this water still supports a number of mills. By 1793, when the Old Statistical Account was written, the Water of Leith was driving no less than 80 mills of various kinds in its 14 miles to the sea.³ The original choice was determined by the market offered by the capital city as well as by the supply of rags available there.

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1. A.P.S. Vol. IX p.340. 1693 c.83. (This was an act confirming the decision of 1690). The date on the advertisement for the set of James Hamilton's playing cards in the National Library is 1691 so the mill was presumably working then. The passing of the Act in 1693 may also indicate its continued existence.
 2. S.R.O. Edinburgh Commissariat 23 Nov. 1714. Peter Spence.
 3. O.S.A. Vol. V p.323.

List of Mills established 1700 - 1800

Valleyfield (Pennycuik)	1708
Jinkabout	1714
Cathcart (Millholm)	1716
Bogsmill (Colinton)	1717
Springfield (Polton)	1742
(Lasswade Simpson ?)	1744
(Lasswade Simpson 2 ?)	1744
Balgray No. 1	1746
Low Mill, Pennycuik	1746
Dalmuir	1747
Melville (Lasswade)	1780
Peterculter	1750
Polton	1750
Auchendinny	1756
Broomhouse	c 1760
Midcalder	1761
Crieff	1763
Tongland	c 1766
Galston	1770
Stoneywood No. 1	1770
Saltoun	1773
Esk mill	1775
Redhall (Colinton)	1777
Crieff (New mill)	1780
Dalbeatty (Mount Pleasant)	1780
Dalsholm	1783
Kate's Mill	1783
Stoneywood No. 2	1786
Sauchie	1787
Herbertshire	1789
Ayton (Millbank)	1790
Balgray No. 2	1790
Ninleith	1792
Perth	1792
Woodhall	1792
New Kilpatrick	1793
St. Leonards	1793
Methven No. 1 (perhaps 1776)	1794
Methven No. 2	1794
Newbattle	1795
Stoneywood No. 3	1796
Byrnie (Balerno)	1799
Falkirk	1799



PAPER MILLS STARTED BETWEEN 1700 AND 1800.

FIG. 1.

The Period 1700-1800 - the areas develop.

In the century up to 1800, when all paper was still hand made, several new areas developed, and forty three mills were started - see map, fig. 1. In the vicinity of Aberdeen, four mills were started. The first was at Peterculter in 1750, on the Culter burn,¹ and the other three were at Stoneywood on the Don in 1770, about 1786² and in 1796.³ Again it must have been the Aberdeen market that attracted the establishments. Economically and numerically the city was developing considerably during the century. Population figures are not available for the early years, but quoting Webster's 1755 census figures, the Old Statistical Account gives the city population (Old and New Aberdeen and Footdie) as 15,730 and its own 1790-1798 figure as 24,227, an increase of 8,497 from 1755 to 1790-8.⁴ The Aberdeen Journal was first published in 1747, while two years later the Banking Company of Aberdeen, the first private banking company to issue notes in Scotland, was

1. Aberdeen Journal 8 Jan. 1751 advt. and Cormack A.A. Our Ancient and Honourable Craft, p.15.
2. Gillis W.P.T.R. 6 June 1913 gives the date of origin as Sept. 1770 when the ground was leased. In the Aberdeen Journal for 18 Feb. 1771, the new mill was expected to be in operation a few months later. S.F.I.P. No. 313288 (9th July 1772) insured the paper mill and its contents. However S.F.I.P. No. 528115 (28 Feb. 1787) covers for Alex. Smith of Stoneywood"... his two paper mills, going by water .. situated as aforesaid both under one roof..." This indicates definitely a second mill. The 'double-registration' is similar to that of Edward Collins at Dalmuir shown in the OB and R.W. list of 1832 as mills No. 21 and 69, both Collins and both Dalmuir.
3. Gillis W.P.T.R. 6 June 1913.
4. O.S.A. Vol.XX p. 587. Kyd J.G. Scottish Population Statistics (Scottish History Soc. Vol. XLIV) quotes 22,000 as Webster's figure for Aberdeen (p.52 footnote) but does not give a figure for 1801. The county figures of

¹ started. From about 1745, the spinning of linen yarn was introduced and woollen manufacture (combing, spinning and knitting) was also important, and from about 1789 a considerable range of cloths was made. At this period also, Aberdeen was the largest producer of thread in Scotland.² Such enterprises were all indications of the expanding and developing economic activity, which supported and justified the paper mills in the area. The possibilities were sufficient in the case of the Culter mill to attract a paper maker, Bartholemew Smith,³ from England. The Don establishments were started by local men.⁴ The amount of the Scottish excise total contributed by the Aberdeen collection was perhaps not as large as might have been expected, averaging 4.4% over the period 1764 - 1800 with the highest years between 1776 and 1785 when the average was nearly 6%.

4. Contd.

increase are respectively O.S.A. 6085, Kyd 4897. Though the figures do not agree, it seems clear that there was a substantial increase.

1. Kerr A.W. History of Banking in Scotland P.63.
2. O.S.A. Vol. XIX pp. 202-209 gives a full account of the local industry, naming firms and giving some quantities.
3. Aberdeen Journal 8th Jan. 1751. "Bartholemew Smith, paper maker from England who has now erected and set a-going .. a paper mill.."
4. Gillis W.P.T.R. 6 June 1913. John Boyle, bookseller & printer, Head of the Broadgate and Richard Hyde, dyer, leased for 114 years (6 x 19 yrs.) the island of Stoneywood in September 1770. Subsequently Alexander Smith, a local wig maker and barber surgeon became a partner and then proprietor. Under his aegis the second Stoneywood mill was started about 1786. His nephew Charles Smith started the third Stoneywood mill in 1796. These Smiths have no connection with Bartholemew Smith of Peterculter.

Another existing area to be developed was that centred on the Water of Leith. There was considerable expansion here and no less than seven additional paper mills were established before 1800. The first of these, called Jinkabout, was started in 1714 by John Reid, printer and owner of the Edinburgh Gazette.¹ This mill was on the north bank between Colinton and another early mill called Bogsmill. This second mill was started in 1717 by Nicol Lithgow who leased an existing corn mill (Vernon's mill)² and converted it to paper making. It is still in operation. Almost at the same time came the start of Redhall mill by William Hamilton of Little Earnock,³ and after this there was a considerable pause before the next mill was started. It is probable that the economic development at the time was adequately supplied, as far as paper was concerned. As will be discussed presently, a new area near Edinburgh was developed with five mills by 1750 and with other more remote mills being started, it is perhaps not surprising that the Water of Leith did not continue to expand.

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1. Waterston R. B.O.E.C. Vol. XXVII pp. 48, 49.
 2. Information from Mr. John Tweedie.
 3. William Hamilton was the son of James Hamilton who was at Restalrig. R. Waterston gives 1718 for Redhall, J. Tweedie gives 1716.

The entrepreneurs were, for the most part, Edinburgh men, who, if they found the Esk a new and profitable area, would not need, or perhaps be able, to expand on the Water of Leith also. The next establishment traced then, on this water, was Kate's mill and it dates from 1783 and was an extension by an existing paper maker.¹ Five years later, the Balerno mill of Nisbet and McNiven was started² and in 1792 Kinleith mill, which is still in operation, was started under a co-partnery³, but was insured and operated by Robert Walker.⁴ The seventh new establishment on the Water of Leith (bringing the total to ten in all) was the Byrnie mill, started in 1799 by John Logan, previously the overseer at Nisbet and McNiven's⁵. During the period to 1800 then, this area expanded considerably and by 1765 was producing just over 20% of Scotland's paper. This percentage was not maintained and fell slowly till 1778 when it was 13.6. From then till 1784 it averaged just under 9% with the Glasgow and Teviotdale collections picking up the Edinburgh drop.

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1. John Balfour, owner of Redhall mill, had a dispute with the ground superior, George Inglis, about an extension and leased the site for Kate's mill from James Foulis of Colinton. It was bought by the Inglis family in 1799.
 2. O.S.P. 206.8
 3. Information from Henry Bruce & Sons. The partners were Robert Cleghorn £1500, Barclay Fife £1000, Alex. Cunningham £1000 and Robert Walker £500 (Manager).
 4. O.S.A. Vol. V. p. 323 and O.S.P. 206.8
 5. Ibid.

However from 1785, shortly after Kate's mill was started, the percentage again rose and averaged just over 20, up to 1800. The highest figure was in 1794 when 30.5% of Scotland's output came from this area: such figures underline its importance in the industry.¹

Dating from 1708, another complete and separate area developed. There was, it is true, a certain exchange of skilled labour between it and the Water of Leith area, but it developed and expanded on the Esk waters. Places in the area concerned are Auchendinny, Inveresk, Lasswade, Newbattle, Pennycuik and Polton. The first establishment in this new district was the Valleyfield mill at Pennycuik started by Mrs. Agnes Campbell in 1709.² Paper is still made at Valleyfield and this long geographical continuity is a feature of the Scottish paper industry and in particular of the Pennicuik area. Auchendinny is credited with the date 1716 for its commencement.³ but it is possible that the mill was not then a paper mill. William Annandale was there making paper

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1. S.R.O. Collectors' States of Accounts
 2. In April 1709 Sir John Clerk leased land to Mrs. Agnes Campbell or Anderson, widow of Andrew Anderson, King's printer from 1671 till his death in 1676. "... with liberty to erect a paper mill.. and to take water from St. Mungo's well." Clerk Muniments No. 885.
 3. Waterston B.O.E.C. Vol. XXVII p.54.

however from 1745-1782¹ and in 1756 he was awarded two silver medals for his paper by the Edinburgh Society.² Some years later in 1742, Walter Ruddiman of the Caledonian Mercury and Robert Fleming of the Edinburgh Courant together with John Aiken, a bookseller, started Springfield mill at Polton.³ This mill is also still in operation. In 1749 Richard Nimmo of Edinburgh converted a waulk mill to paper manufacture and it was known as Low mill, Pennycuik.⁴ Next to be established was Polton mill (1750).⁵ Melville mill, Lasswade, was started about 1750 or so by John Hutton, an Edinburgh merchant.⁶ The seventh establishment in this area was Esk mill, Pennycuik, said to have been founded in 1775 by Peter Brotherstone.⁷ In 1792 or 3 William Simpson started the St. Leonards mill at Lasswade⁸ - another mill still

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1. Carnie R.H. 2nd Supplement pt.1 to Bushnell. Scot.Hist.Soc.p.86.
 2. Scots Magazine No.34 Feb. 1756 and Jan. 1757.
 3. Waterston B.O.E.C. Vol.XXVII p.55.
 4. O.S.P. 265.24.
 5. Gillis W.P.T.R. 24 Jan 1913 and Cairns J.B. Bright and Early p.146
 6. S.F.I.P. 211333 7th Aug. 1764 "John Hutton in Edinburgh, merchant on his machinery in the paper mill of Melville.. in the parish of Lasswade.. "
 7. Information from present owners James Brown & Co.Ltd., but O.S.P. 449.23 (Feb. 19, 1803) makes it a cotton mill in 1775.
 8. S.F.I.P. 608376 (24 Nov. 1792) Wm.Simpson insured "... his house at St.Leonards new drying house, new workhouse, sizing house.. " and in the following year S.F.I.P. 615222 (27 May 1793) "... his paper millhouse, vat house .." Then in O.S.A. Vol.X p.279 the writer on Lasswade listing in 1794 various mills, gave 4 paper mills, and a fifth recently added."

in operation. The last mill so far traced, before 1800, in this area was at Newbattle. In 1795 Archibald Keith, who for a long time had been a mould maker, bought some of the machinery of Melville mill and built a small paper mill at Newbattle on a piece of ground belonging to the Marquess of Lothian.¹ This mill was subsequently operated and enlarged by Robert Craig & Co., and continued in production till 1890.

As has already been stated, it is not possible to give relative output figures for the different excise collection areas before 1764. From this date, however, to 1824, the mills on the Esk can be said to have dominated, if not constituted, the whole of the Haddington Collection.² In the period 1764-1800 there were only four years in which Haddington contributed less than 40% of the Scottish total, while in 1772 its percentage was over 60.³ In all this period therefore it can be said that the Esk valley was the most important paper making area in Scotland.

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1. O.S.P. 502.65. He figures too as mould maker in the Herbertshire documents (1789), in Joshua Gilpin's Journal (1795). S.F.I.P. 729110 (26 Jan. 1796) insured the mill. He also started a mill for his son at Rothes in 1806 but became bankrupt in 1810.
 2. The only other mill in the Haddington area was Saltoun, which in 1787 was insured by Robert Laing for only £160 (S.F.I.P. 531913) and was therefore small. Loftus' Inland Revenue Almanak 1854 lists the Haddington districts and gives Lasswade and Pennycuik and though it also lists Ayton it is probable that these Berwickshire mills paid to the Teviotdale Collection till 1824 when the entries for that collection cease. Thus it is contended that the Esk mills accounted for the bulk of the Haddington Collection.
 3. Derived from S.R.O. Collectors' States. of Accounts.

In the west, following quite quickly on the Cathcart mill of Nicolas Dechamp, came Millholm at Newlands, Cathcart by 1716.¹ This was the first of a group of six mills. They were not all on the same river but can for convenience be considered to form an area of their own. The second of these was Edward Collins' mill at Balgray in 1746. Due to the irregularity of the water supply he moved to Dalmuir in the next year.² It is not known if any change in water conditions occurred at Balgray, but another mill was operating there in 1790 under one James Duncan.³ At Dalsholm a mill is mentioned in Tait's Glasgow directory of 1783: the operator was William McArthur and this is still in operation. In 1793 a mill was started at New Kilpatrick.⁴ This group contributed an average of ten per cent. of the Scottish output from 1764-1800 and although not so great as the

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1. O.S.A. Vol. V, p. 344 a small mill employing 8 men. Glasghee Facies (Ed. J. F. S. Gordon) Vol. II, p. 1224 says his (Dechamp's apprentice, John Hall, who married his daughter, erected one on a larger scale at Millholm. It seems from the O & B and R. W. list of 1832 that Millholm (Excise No. 18) was then the larger with 3 vats to 2 for Cathcart (Excise No. 19). "John" Hall seems to be an error. James appears in the roll of the Burgesses and Guild Brethren of Glasgow as "Paper maker at Newlands, admitted 4th December 1716. In the Glasgow Commissariat occurs "Isobel Lang, lawful daughter of Robert Lang, Comptroller of H. M. Customs of Glasgow and spouse of James Hall paper maker at New Paper mill of Cathcart." 28 Feb. 1763.
 2. Information from E. Collins and Sons, Kelvindale.
 3. S. F. I. P. 577974 30 Dec., 1790.
 4. O.S.A. Vol. VII, p. 103.

Water of Leith area, it was nevertheless of quite considerable magnitude and importance.

Extending from Methven as far as Crieff and probably to Perth itself, an area which paid its excise to the Perth Collection developed with the establishment of four or possibly five mills. The first two of these were at Crieff, started in 1763 and 1780.¹ They do not seem to have both been in operation at the same time and Stobie's map of 1783 shows only one paper mill. Two further mills were in operation at Methven, operated by Morrison & Lindsay of Perth, when the Old Statistical Account was published.² The number employed is given as 70 and the weekly output is listed both for qualities and quantities. These were certainly established before 1794 when the Account was published and may have started about 1786 or 1776 as significant increases in the amount of excise collected at Perth occurred in these years. Under Perth itself, the Account mentioned three mills "in the neighbourhood"³ and again Morrison and Lindsay are mentioned.⁴ Methven is probably included,

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1. Ibid. Vol. IX, p. 592.
 2. Ibid Vol. X, p. 617 "There are two paper mills belonging to Messrs. Morrison & Lindsay of Perth with weekly manufacture; Superfine, post, foolscap, 60 rm. Fine and common printing 90 cm. Cartridge, blue and wrapping 50 rm.
 3. Ibid, Vol. XVIII p. 517.
 4. It is almost certain that Morrison & Lindsay was a paper making concern connected with the printing and publishing firm Morrison of Perth, printers to the Univ. of St. Andrews and with an output of 20-30,000 vols. per annum. They made Perth second only to Edinburgh in publishing in the late eighteenth century. Moreover the Lindsays were connected by marriage. See N.S.A. Vol. X, p. 1.

though Crieff seems a little remote. Moreover the annual output figures are quoted¹ and it seems on comparison with the weekly figures for Methven that there must have been another mill - probably in Perth itself. For the last thirty years of the eighteenth century the Perth percentage of the national collection averaged just over 5, so this can be reckoned as one of the smaller areas - as distinct from the isolated mills. The considerable size of the linen manufacture of the Perth area would be a considerable help in supplying raw materials for the paper making ventures.

A mill which might be considered geographically to be on an extension of the Water of Leith area is that at Midcalder, on the Almond. However, as during the period of this study this mill and other subsequent mills in the vicinity paid their excise duties to Linlithgow and not to Edinburgh, Midcalder has been kept separate from the Water of Leith mills. Mentioned in the Old Statistical Account as a "small mill",² it was established in 1761 or 1762 by two paper makers from Yester.³ The mill

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1. Writing and printing 9-10,000 rm. blue 7-8,000 rm.
 2. O.S.A. Vol. XIV p.359.
 3. S.R.O. Particular Records of Sassines Edinburgh Vol.175 f.181 (12 Dec. 1766) refers to Adam and Joseph Robertson, sometime paper makers at Gifford, taking the paper mill in Dec. 1761. The mention of a mill implies its prior existence, but entry at December might mean January or later for the first production.

seems to have been quite small, being listed as having one vat in 1825¹ and again in 1832 in the O & B and R.W. list. No other early paper mill has been traced in this area. There was a mill known as Adam Brae, operated in 1825 by John Johnson,² which was built in 1730 as a grain mill and "since engaged in the manufacture of paper"³ but this is not sufficiently definite. The reason for the search for some other mill in the area arises from the fact that for the first eighteen years of the excise records (from 1764-1782) the Linlithgow Collection averaged 7.5 per cent. of the total Scottish output.⁴ This is excessively high for one mill. It indicates however that the area was important during the period.

In the south west part of the country, in the Stewartry of Kirkcudbright, two paper mills were established, one at Tongland, the other at the newly formed village of Dalbeaty. Chalmers credits both mills with a post-1780 foundation,⁵ but Tongland was certainly operating before this. Allan McLachlan took apprentices there in 1774 and 1775.⁶ Prior to this,

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1. Gillis W.P.T.R. 8 Nov. 1912
 2. Pigot's Commercial Directory of Scotland.
 3. McColl. History of the parish of Midcalder (Edinburgh 1894) p. 41.
 4. S.R.O. Collectors' States. of Accounts.
 5. Chalmers Caledonia Vol. VII. p. 297
 6. P.R.O. Apprentice Books I.R.I. 60. p. 92 (38) Allan McLachlan of Tongland, paper maker, took Robert McDonald 2 Sept. 1774 and (39) James Duff 12 April, 1775 and (40) John Boid II July, 1775.

To all good Housewives, and others, willing to advance and promote Thrift, and the Manufactures of their Country.

WHEREAS great Sums of Money were formerly sent to *France, Holland, &c.* for Paper, and are now sent to *Holland, Hamburgh, and France* for old Linen Rags, for the making of this useful Commodity, which Money would be saved at home if old Rags were properly preserved:

This is therefore to inform the Public, That

ROBERT TAYLOR
BOOKSELLER in *BERWICK,*

Hath erected a large Paper-Mill at *Broomhouse*, near *Dunse*, and gives the most Money for old Linen Rags, old Ropes, Sacks, and every thing made of Lint or Hemp, and likewise for Tailors Shapings or clean Woollen Rags. All Persons may be furnished by him with all Kinds of Writing, Printing, Brown, whiten'd Brown and Blue Paper, Pasteboards for Bookbinders, and Ladies Hats or Bonnets, in Wholesale or Retail, as cheap as at *London, Edinburgh, Newcastle*, or any other Place.

Our Paper-Manufacture takes into it several mean Materials which could be put to no other Use, and affords Work for several Hands in the collecting of them, which are incapable of any other Employment. Those poor Retailers, whom we see busy in every Street, deliver in their respective Gleanings to the Merchant. The Merchant carries them in Loads to the Paper-Mill, where they pass through a fresh Set of Hands, and give Life to another Trade. Those who have Mills on their Estates, by this means considerably raise their Rents, and the whole Nation is in a great measure supplied with a Manufacture for which formerly she was obliged to her Neighbours.

Mr. ADDISON *Spectator*, Vol. V. N^o. 367.

All Kinds of Printing Work are performed by the said *Robert Taylor* in the most neat and expeditious Manner; all Sorts of Books bound in the best Manner; new Books and Stationary-Ware of all Kinds sold as cheap as in *London*, and new Books lent to read at moderate Prices.

Common Rag-Gatherers will meet with the best Encouragement, and all honest, industrious poor Persons be supplied with small Money and other Commodities for purchasing Rags.

N. B. All Sorts of Rags are likewise taken in, and Paper sold at his Warehouses in *Alnwick, Wooller, Kelfo, Jedburgh*, at *Mr. Haig's* in *Dunse* and at the Mill at *Broomhouse* near *Dunse*.

Persons delivering in Rags for the above Mill will be entitled to the Premiums given by the Society for encouraging Manufactures, &c. in *SCOTLAND*.

in 1772, the mill was advertised for sale after a fire which occurred in April of that year.¹ The starting date may well have been 1765 or 1766 as the excise returns for the Dumfries Collection show a return each year from 1766² (except for 1772 when the fire occurred). The average percentage of the national gross products was just under 2 up to 1800, which is about what would be expected for two small mills, The date of the Dalbeaty mill, known as Mount Pleasant, may well have been in the 1780's, for the writer in the Old Statistical Account (1794)³ says the paper mill was started "some years since", and an apprentice was taken by Wm. McCochtrie in June 1793.⁴

In the south east, in Berwickshire, a small group of mills was started in the eighteenth century. The first evidence of a mill is an undated handbill issued by Robert Taylor, a Berwick bookseller.⁵ From internal evidence it can be deduced that the mill was erected about 1760.⁶

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1. Newcastle Journal 30 May 1772.
 2. S. R. O. Collectors' States. of Accounts.
 3. O.S.A. Vol. XI, p.75
 4. P. R. O. Apprentice Books I. R. I. Vol. 67, p.26. Wm. McCochtrie of Mount Pleasant took Luke Trevor, 20 June, 1793.
 5. Oxford University Press Library Archives per Harry Carter.
 6. The reference to the Edinburgh Society for encouraging manufactures etc. offered their premiums from 1755 (Scots Magazine March 1755) till 1764 (Calendonian Mercury 18 April 1764) so a date c.1760 seems reasonable for the mill.

Apprentices were taken in 1783, 1784 and 1785¹ but the mill was advertised for sale in 1788² and was taken over by John Pitcairn³ who ~~was~~ later joined by his brother-in-law, Young Trotter. Subsequent insurance of this eight vat mill at Broomhouse for £7,500⁴ shows it to have been a very large and important concern. The second mill in the district was at Ayton. This mill, known as Millbank, was certainly operating in 1785 when it was insured by John Taylor,⁵ who, however, failed eight years later, and issued a notice to his creditors in 1793.⁶ The mill was taken over and continued in operation until 1869 when it was completely destroyed by fire.⁷

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1. P.R.O. Apprentice Records I.R.I. Vol. 63, items 43, 44, 45 and p. 41 items 22, 23 and p. 220 items 50, 51. Henry Taylor took respectively James Trunch, 17 Aug., Robert Durney, 19 Aug., and John Todd, 2 Oct., 1783, John Dods, 10 Jan. Robt. Darling, 16 Jan. 1784, and Wm. Johnson, 21 Dec., and John Purves, 1st Dec., 1785.
 2. Newcastle Courant. 19 July, 1788 (advt.)
 3. John Pitcairn also operated Melville Mill, ~~Lass~~wade, was the first Chairman of the Directors of the Commercial Bank of Scotland (1810) and was Chairman of the Edinburgh Chambers of Commerce (1820) - Waterston B.C.E.C., Vol. XXVII, p. 59.
 4. S.F.I.P. 737137 29 Sept., 1802.
 5. S.F.I.P. 501464 3 Feb., 1785.
 6. Newcastle Courant. 4 May, 1793 (not found at Newcastle). Information from A. H. Shorter.
 7. Information from William Martin, Ayton, Bleachfield.

Though not as large as Broomhouse, Ayton Millbank was of considerable size, for in 1793 it was insured for £4,500.¹ The size of the mills is reflected in the excise returns for Teviotdale. Except for the years 1795-1798, this Collection averaged nearly 14% of the Scottish total from 1785 to 1811² showing it to have been of considerable importance in the late eighteenth and early nineteenth centuries.

In Ayrshire, at Galston near Kilmarnock, a mill was established early in the second half of the eighteenth century. It seems to have had a continuous existence, for there is no break in the excise returns from Ayr from 1764 - 1825.³ Also there is a tantalising reference to Charles Saing, a Galston paper maker who invented a rag-cutting machine in 1770.⁴ Sixteen years later the mill was insured by John Carson for £400⁵ and in 1792 or so the Rev. Mr. George Smith writing

1. S.F.I.P. 622172 Dec. 1793

2. S.R.O. Collectors' States. of Accounts and see appendix.

3. Ibid. From 1764-1787 the percentage of the national product supplied by Ayr was between 0.5 and 0.7 consistent with a small mill expanding at about the same rate as the national output.

4. The Annual Register for the year 1770 (London 1771) p.144 "September 18 Charles Saing, a paper maker at Galston, in Scotland, has invented an engine for cutting rags, which will cut more in one day that eight men can do in the same time".

5. S.F.I.P. 524465 16 Nov., 1786. The sum £400 included a dwelling house, household goods, house, barn, and byre adjoining all for £100.

in the Statistical Account mentioned paper manufacture as "... chiefly of the coarse sort". Clearly this was a small beginning but it continued and, as will be seen, expanded in the nineteenth century.

The last of the eighteenth century mills were started in an area south east of Stirling. There was considerable industrial development in this area where the Carron iron works were established in 1759¹, but in paper making, only a small start to an important area was made in the eighteenth century. The first mill was at Sauchie in the parish of St. Ninian, Stirling. It was a small affair, insured by James and Robert Liddle in 1787 for £300.² Two years later the Herbertshire mill (near Denny) was built by William Morehead of Herbertshire.³ This was an interesting venture for it was built by the landlord for the purpose of letting-tenants were found after the mill was in existence. The usual mode was for the paper maker himself to do the building or conversion.⁴

1. Campbell R.H. Carron Company, Edinburgh, 1961

2. S.F.I.P. 526164 12 Jan., 1787.

3. Herbertshire documents.

4. This method was adopted by Mrs. Agnes Campbell who "... took a lease.. with liberty to erect a paper mill.." in 1708 and she built Valleyfield Mill, Pennycuik. Richard Nimmo converted a waulk mill to paper making in 1749 making Law Mill, Pennicuik. Archibald Keith built Rothes mill in 1806. Robert Tullis converted Auchmuty meal mill to paper making in 1809.

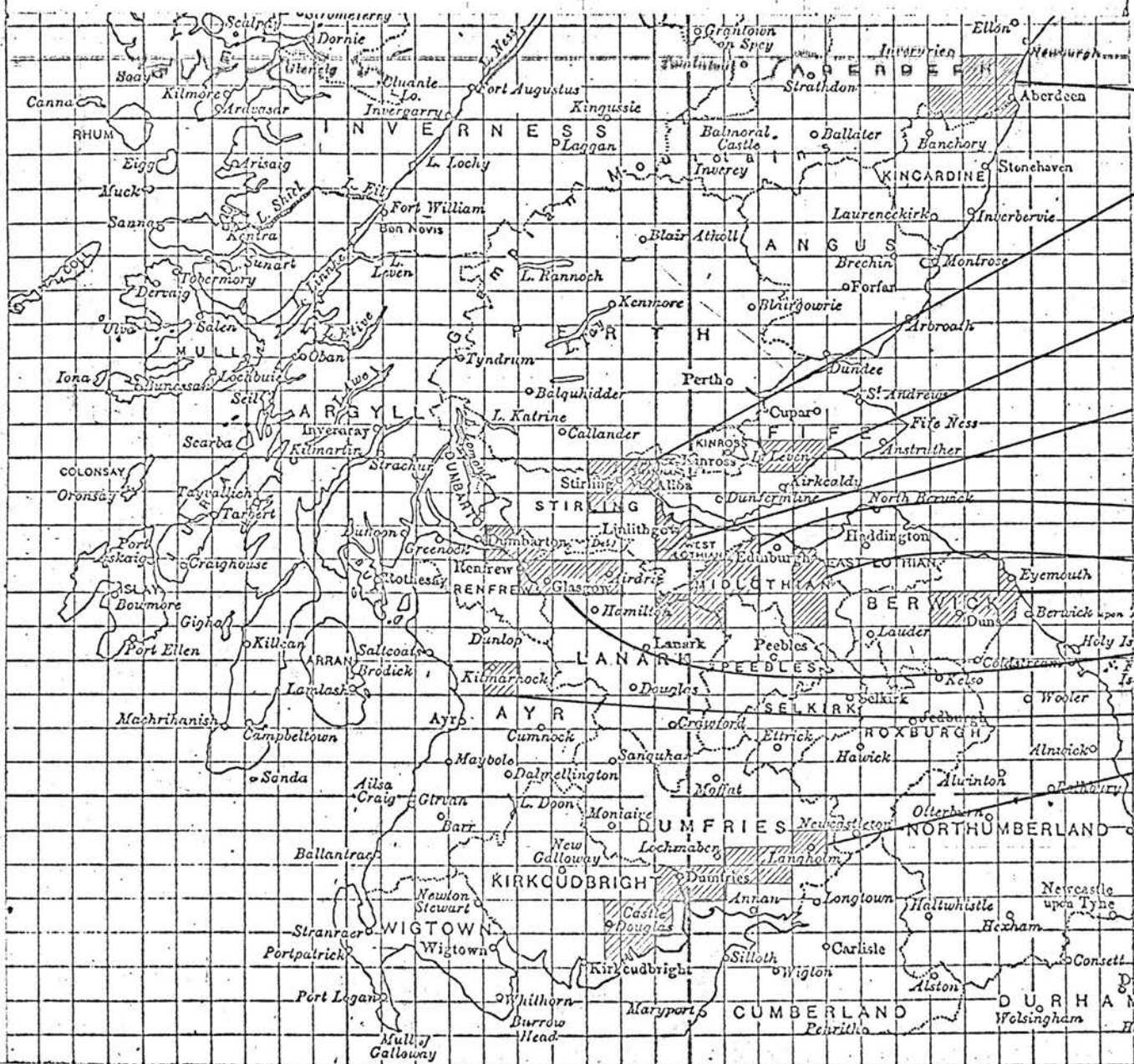
Both these mills were small - the Sauchie one can be judged from its contemporary valuation of £300¹ : the Herbertshire enterprise was also a one vat concern until about July 1795, but its output remained low until a new wheel was installed.² The computed contribution from this area was about one half per cent. of the Scottish total. Hence, although the district round Denny became important and still is so, prior to 1800 it did little more than point the way for subsequent developments.

In the period up to 1800, then, we find the paper industry established in seven main areas. These were centred; on Aberdeen, the Esk Valley, the Water of Leith, Glasgow, a small section of Berwickshire, the district closelyround Perth, the Carron water with Denny as a focus, together with an area in Kirkcudbright and one or two lone enterprises near Kilmarnock, Mid Calder and Haddington. All of these were water driven and their development at least till c. 1825 was on water. Steam was beginning to be used for process work, but there were no eighteenth century examples of its use for motive power.

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1. S.F.I.P. No. 526164 12 Jan., 1787 and 592319, 17th Nov., 1791.
 2. Herbertshire documents - In a letter dated 8 Dec. 1796 written by Gilbert Laing, the tenant's brother, he says, "... from July 1795 to Nov. 1796 only 3002 reams of paper were produced whereas a two-vatted mill should make 5724 reams..."

Mills established 1800-1825

Fossoway (Crook of Devon)	1800
Airthrey No. 1	1803
Bank (Pennycuik)	1803
Devanha (Aberdeen)	1803
Balerno Bank (Old)	1805
Garvald (Stirlingshire)	1806
Herbertshire No. 2	1806
Roths	1806
Duntocher	1808
Bucksburn	1809
Auchmuty	1810
Balerno	1810
Bucksburn No. 2	1810 or 11
Damside (?) (Auchterarder)	1812
Dumfries	1812
Langholm	1812
Peggy's (Cramond)	1815
Balbirnie	1816
Cathcart Netherlee	1818
Dunblane	1820
Galston No. 2	1820
Loch (Linlithgow)	1820
Milton Bog (Auchterarder)	1820
Mugie Moss	1821
Dalmuir No. 2	1822
Moffatt	1822
Adam Brae (West Calder)	1825
Airthrey No. 2	
Allanbank (Edrom)	
Auchterarder	
Colzer (Dumfries)	
Dalbeaty	
Keir	
Leith Head	
New Mill (West Calder)	
Patrickbank	
Townhead (Edinburgh)	
"Excise No. 61" Linlithgow	1825
West (Colinton)	1825



BURROGH:
DEVANHA.
MUGIMOSS.

AIRTHREY 182.
AUCHTERADER 142.
CARRONGROVE.
DUNBLANE.
FESSOWAY.
GARVALD.
HERBERTSHIRE 2.
KEIR.

AUCHMUTY.
BALBURNIE.
ROTHES.

ADAM BRAE.
BLACKBURN.
NEW. (W. CALDER)
LOCH.
EXCISE No. 61.

BALGRO.
BALGRO BANK.
PEGGY'S.
TOWNHEAD.
WEST.

BANK.
ALLANBANK.

CATHCART (NETHERLEA)
DALMUIR.
DUNTOCHER.
MOFFAT.
PATRICKBANK.

GALSTON. 2.

DALBETTIE.
DUMFRIES.
LANGHOLM.

PAPER MILLS, STARTED BETWEEN 1800 AND 1825.

	Aberdeen	Ayr	Dumfries	Fife	Glasgow	Haddington	Linlithgow	Paisley	Perth	Stirling	Teviotdale	Edinburgh	Greenock	Leith	
1800	3.7	1.1	1.1		9.3	41.8	7.0		4.7		13.3	18.0			1800
1	4.1	1.5	0.8		10.9	34.6	10.2		6.2		16.6	15.2			1
2	6.3	1.8	0.7		10.4	31.7	10.9		6.2		14.5	17.8			2
3	9.2	1.7	0.7		10.1	31.9	11.5		6.0		14.0	14.8			3
4	11.2	1.4	1.0		9.7	30.1	11.9		5.6		13.3	15.9	0.02		4
1805	12.0	1.3	1.1	0.16	9.6	32.6	12.4		5.1		13.5	17.8	0.01		1805
6	6.0	1.2	0.8	0.9	12.7	30.0	13.6		5.3		12.7	16.9	0.003		6
7	6.5	1.5	1.7	0.9	16.8	28.5	14.6		7.0		11.3	11.0	0.01		7
8	12.4	1.9	2.1	0.8	17.0	26.9	12.0		6.1		11.1	9.5	0.07		8
9	13.8	1.8	2.3	0.7	16.1	28.3	12.6		5.7		10.5	8.0	-		9
1810	11.9	1.3	2.2	1.6	17.1	27.7	13.3		7.7		10.1	7.7	0.005		1810
1	10.4	1.4	2.8	2.5	17.0	24.6	5.1		10.4	6.05	11.2	8.4	-	0.025	1
2	13.2	1.8	1.9	2.9	15.8	26.7	5.9	7.3	9.8	6.8	7.6	7.7	0.002	0.008	2
3	10.6	1.5	2.3	2.6	16.1	28.4	6.1	6.1	7.9	8.4	8.6	7.8	0.007	0.01	3
4	11.2	1.4	2.7	3.3	16.5	24.5	5.9	8.0	8.2	7.7	10.1	8.5	0.0002	-	4
1815	11.3	1.1	2.6	3.8	18.3	23.7	5.9		8.1	7.8	8.0	9.2	0.07	0.04	1815
6	14.0	1.0	2.7	4.5	17.0	24.2	6.6	9.0	6.6	5.7	8.4	9.3	0.001	0.05	6
7	13.1	0.9	3.3	3.2	17.9	24.1	6.1	6.8	6.9	4.8	7.8	11.2	0.06	0.03	7
8	10.5	1.1	3.2	3.4	16.7	21.5	6.9	8.0	7.4	7.2	9.0	12.6	0.04	0.2	8
9	10.4	0.9	2.9	3.5	17.7	23.6	6.4	9.3	6.5	6.6	9.2	12.4	0.02	0.006	9
1820	10.7	0.8	2.9	3.1	16.2	26.8	5.7		7.1	6.8	8.1	11.8	0.64	0.004	1820
1	10.8	0.6	2.6	3.5	14.8	26.6	5.4	7.5	7.3	7.6	9.6	11.1	0.3	0.07	1
2	11.0	6.0	2.4	3.0	8.2	25.6	6.8	2.8	6.6	8.8	8.2	13.5	0.001	0.001	2
3	12.7	7.9	2.3	3.2	4.6	25.5	8.4	-	6.3	7.3	8.6	13.1	0.09	0.04	3
4	14.0	5.4	2.3	2.8	7.4	29.5	7.7		6.0	8.5	4.5	11.8	0.02	0.04	4

% Contributions from each Collection to the Gross Product for Scotland 1800 - 1824

The period 1800-1825, the last of the hand made mills - a new era begins.

From 1800-1825 a further thirtyseven mills were established. It is not of course the case that all the fortytwo started between 1700 and 1800 were still in operation, for the number of licences issued to paper makers in 1800 was only 32,¹ but in 1826 the number was 62.

Although nine mills had been established in the eighteenth century in the Esk Valley, only one was added between 1800 and 1825. This was the Bank mill, Pennycuik. The date of this mill was 1803.² With other Collections being formed in the period (e.g. Fife and Stirling) it is not surprising that the contribution of this area to the Scottish total dropped to an average of 28.2%. This however was still more than twice as much as that of the next largest Collection, Glasgow. The reason for this would seem to be that the mills in the Haddington Collection were all fairly large establishments, that is, the average size was large. In 1825 the number of mills registered in the country being 64, the average percentage of the total per mill would be 1.56%. In the Esk area, contributing 36.2% in 1825, even

1. S.R.O. Excise accounts.

2. Although the first mention of Bank mill in Cowan's wages books is for the period 21 Mar. - 18 April 1807, the names of most of the employees occur in the previous entries in a general (un-named) list. The book for 1803 has not been found. In O.S.P. 265.24 it is recorded that Cowan's mill was accidentally burned, and that rebuilding with a changed water supply taking in the corn mill was done by the summer of 1803

assuming all ten mills were in operation, the average per mill was 3.6%.¹ A further reason for this, as will be considered in the Machine chapter, was the early use of the paper making machine. Of the 13 machines installed in Scotland before 1825, at least four were in this area.²

The Water of Leith area saw five or possibly just four mills started in Balerno and Juniper Green. One at Cramond, some six miles from Colinton, though in the geographical area, was for excise purposes in the Linlithgow Collection. Balerno mill when operated by Kilgour and Paterson in 1825 had three vats and was established some time before 1810.³ Then the "old" Balerno Bank (Excise No. 50) was started about 1805.⁴ It was a small mill and was incorporated some time after 1832 into another mill of the same name (Excise No. 15)⁵

1. Derived from S.R.O. Collectors' States. of Accounts.
2. See list of machine installation dates, chapter 6 p.
3. In the Rothmill Quarterly Vol. XXX No. 2 it is reported that the first manager of Auchmuty mill, which started in 1810, was Alex. Grieve "late of Balerno paper mill". For an earlier date than this however Shorter in The Papermaker, August 1960, quotes S.F.I.P. No. 372819 (27 Aug. 1776) in which Robert Douglas insured Balerno Paper mill. Unfortunately the original policy book is now missing so no details can be checked to confirm the suggestion that this was the mill insured by Nisbet and McNiven in 1796 (S.F.I.P. 651503).
4. Caledonian Fire Policy Book No. 1 C.292 2nd Oct., 1805 - Mr Walker of Balerno Bank insured his paper mill.
5. In O & B and R.W's list of 1832 No. 50 appears but not No. 15. In T & C's list of 1852 and in the Paper Mills Directory of 1860, No. 15 appears but not No. 50.

A short-lived mill in Balerno known as Townhead, appeared in 1825, operated by Wm. Blackie, but it had closed by 1832.¹ In 1825 also John Milne was at the two vat Woodhall mill, which may have had an eighteenth century existence, but no confirmation has been found.² Lastly the West mill at Colinton is listed in 1825 as occupied by John Smiles, though he has not been found in the Edinburgh directories. The mill long outlived the period of this study. These mills were not a large addition to the area and its contribution to the national total was not maintained during the period. It averaged 16% from 1800 to 1807, sustained a sharp drop, averaging only 8.4% from 1808 to 1816 and rising quite as steeply to average 12.1% from then till 1825. It would seem that the war affected this area with closures more than others, though firm information is lacking.

In strong contrast was the expansion in the Aberdeen area. To the four existing eighteenth century establishments were added four others. In 1803 Alexander Brown, bookseller, and his father-in-law,

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1. This is listed in the "Gillis 1825" list see p. in Appendix. It does not figure in the O & B and R.W. or subsequent lists.
 2. This appears in the 1825 list but Shorter notes that in 1792 a lease to Mark Stark included the fall of water at the paper mill (present owner's information). Unfortunately the present owners now seem to have no knowledge of this lease.

James Chalmers, printer and publisher of the Aberdeen Journal, built a mill at Craigbeg Ferryhill.¹ This project was short-lived, as it was sold in 1807² and Lewis Smith of the Culter mills bought most of the machinery. It is interesting that this mill at Ferryhill was the first paper mill in Scotland to instal a Watt steam engine, though this seems to have been the second steam engine to be installed in a Scottish paper mill.³ The mill itself, after the sale, was made into a brewery.

A mill which can be called Bucksburn No. 1, was in the occupation of Alexander Steven prior to 1809, when there was a sale of the machinery, some paper and household effects.⁴ This sale was by the Excise Office, Aberdeen, so it is clear that Steven had defaulted on excise payments. No information on the start of the mill has been found, but it is assumed to have been an early nineteenth century foundation. After the foup, the premises were converted to a woollen mill. Shortly after this, possibly in 1810, James Hogg started

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1. Cormack A.A. Our Ancient and Honourable Craft. Also Paper making on Deeside, The Deeside Field 1933, p.40
 2. Aberdeen Journal 25 Feb. 1807.
 3. Coleman D.C. The British Paper Industry p. 112 quotes 1802 and Birmingham Ref. Lib. Boulton & Watt Collection portfolio 16.235, but see also chapter 6 p. footnote.
 4. Aberdeen Journal Wed. 22nd Nov., 1809 "Sale of paper maker's machinery etc. at Bucksburn ... by virtue of a warrant from the Justices of the Peace of Aberdeenshire .. The whole .. belonging to Alexander Steven ... Excise Office, Aberdeen, Nov. 17. 1809.

Bucksburn No. 2 on a nearby site, and was still there in 1825, when the mill is listed as having one vat and "a couching machine" which may have been one of Cameron's paper machines invented in 1816.¹

The fourth mill to be started in this area was at Mugie Moss and from this stemmed the present headquarters of C. Davidson and Sons. In 1811 Charles Davidson leased some ground from Mr. Forbes of Seaton and erected premises comprising flax beating and snuff. This flax beating continued till 1821 when paper making was introduced to take in that part of the mill.² The snuff was discontinued in 1830. In the period to 1825 then it can be seen that the mill was an expanding concern. This expansion was reflected too in the area as a whole. The percentage of the Scottish output of paper averaged just over 3, up to 1800. In the ensuing twentyfive years, this average rose to just under 11 per cent.³ This nearly fourfold increase in importance in the economy is partly explained by the existence in the area of three paper making machines, two at Peterculter and one at Stoneywood.⁴

1. Gillis, W.P.T.R. 18 Apr. 1913. See also chapter 6.

2. Cruickshanks J. Newhills - the annals of the parish 1934.

3. Derived from Collectors' States. of Accounts.

4. See list of machine installation dates. chapter 6

In the west, five new mills were established in the first quarter of the nineteenth century. By 1808 (possibly in 1806) Joseph Combe was operating a mill at Duntocher.¹ In 1817 the operator was James Watson who was there at least till 1825.² Cathcart Netherlee was the third mill to be started at that town, and this was some time before 1818.³ It had two vats. The operator, Archibald McGown (or McGowan) had a Glasgow warehouse in Stockwell Place. He sustained at least two prosecutions for excise offences.⁴ At Airdrie, Moffat mill was started in 1822 by Hugh Liddle, John McLaurin and George Balloch, all of Denny. There were three vats, but considerable expansion and change took place after it passed into the hands of the Craig family.⁵ Just about the same time (1822) Richard Collins (the son of Edward Collins who had founded the firm in 1746) started another another mill at Dalmuir (Excise No. 69). It had three vats and possibly

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1. S.F.I.P. 817960 (13 June 1808) shows Joseph Combe insuring his mill at Duntocher for £1200. However in 1806 the Glasgow Excise Collection showed a rise in its percentage of the Scottish total from 9.6 to 12.7%. In 1807 it was 16.8% and then averaged 16.5% till 1821. Rearrangements of the Collections in this area and the introduction of Greenock and Paisley prevent any further analysis.
 2. S.F.I.P. 928380 (14 Mar. 1817^T) and Gillis W.P.T.R. 1 May 1914.
 3. Glasgow Directory for 1818.
 4. P.P. 1831 (346) XV.539 and Gillis W.P.T.R. 31 Oct. 1913.
 5. A Century of Papermaking, Edinburgh 1920, p.25 (Craig's House history).

the fact reflects the conservatism of Richard, who was then aged seventy. He died the same year, leaving the business to his eldest surviving son James (aged 31) who retired within a year or so in favour of his brother Edward. By 1825 he had installed his first machine, the first in the West: a new era was dawning.¹ The fifth mill noted in the area was at Patrickbank in the short-lived Paisley Collection. It too was a three vat mill operated in 1825 by Walter Miller.² Up till 1825 however it seems that the expansion of hand made mills in this area kept pace with the industrial expansion and needs of Glasgow itself.

The area round Stirling and Denny saw the establishment of ten more mills before 1825. There is some doubt and even confusion about small mills in the same area, but it seems that the first in this group was Fossoway at Crook of Devon. Started by John Luke, possibly as early as 1800, it certainly remained in that family till 1885.³ Of the two mills started at Airthrey, the earlier one was begun by Robert Ferguson, probably in 1803.⁴ It was a one vat concern occupied by James McRobie before 1819.⁵ The second Airthrey mill was also

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1. Information from E. Collins Ltd. shows land feued in 1818 and Dalmuir House built. In 1822 the number of vats is given as eight, but there were five at the old Dalmuir (Excise No. 21) so the new mill had three. Both mills are listed in 1825 and subsequently.
 2. The "1825 list".
 3. Paper Makers' Directory of 1885 lists the mill and gives date of origin as 1800. p. 204.
 4. S. F. I. P. 755996 (15th Nov., 1803) "... Robert Ferguson, paper maker of Bridge of Allan ..."
 5. Kennedy, M. R. Reminiscences of a paper maker in the early

started by Ferguson who was subsequently fined and imprisoned for smuggling. After this, McRobie took over this mill also. In 1820 John Campbell occupied Damside mill (Excise No. 4), and Gregor Murray was at Milton Bog (Excise No. 3), both at Auchterarder.¹ One of these was there at least by 1812, since M.R. Kennedy was in that year apprenticed to a mill at Auchterarder. Then in 1825 Alexander Ferguson, who was related to Robert Ferguson of Airthrey, is listed at yet another mill at Auchterarder (Excise No. 2)². He too was fined for excise offences in 1830. On the Carron river a second mill was started on the Herbertshire property in 1806 by Charles Laing.³ In the same year there is a record of "William Smaill, paper maker at Garvald near Denny"⁴ and in 1825 this had passed into the hands of Burns and Muirhead. The two

5. (Cont.) XIXth century, the American Paper Trade Journal, 1885. In this Kennedy records his apprenticeship as starting in 1812 "at Auchterarder". His references to "the Fergusons" make it unlikely that it was one of their mills. He went to McRobie at Bridge of Allan (i.e. Airthrey) in 1819 and to Luke at Fossoway in 1827. Gillis W.P.T.R. 1 May 1914 also gives information on Airthrey. Prosecutions of Ferguson are in P.P. 1831.346 (XV) 529.

1. Pigot's Commercial Directory of Scotland 1820, 1821-3.
2. See the 1825 list Appendix p.329.
3. Herbertshire documents.
4. S.F.I.P. 793723 (20 Aug., 1806).

last mills have left little trace, save their names and operators. In 1820, James Ferguson was at Dunblane, while in 1825 the occupant was John Ferguson. In this year also Robert McRobie was at Keir mill, Stirling.¹ As indicated above, there is likely to be confusion with many small mills of short duration in closely situated areas, but as foreshadowed by the small Sauchie mill (1787) and the first Herbertshire mill (1789), the area was one capable of considerable development. It is not possible to give exact percentages for the contribution by the area to the country's output over the whole period. In 1811 however a Stirling Collection was established and from then till 1825 it averaged 7.2 per cent.² That the establishment of a new Collection was considered necessary, shows the growing importance of this area. What is unfortunately not clear is, where the mills existing before 1811 paid their dues previously: perhaps surprisingly Linlithgow seems more likely than Perth from the excise figures.

In the area covered by the Linlithgow Collection seven new mills arose before 1825. The first of these was Peggy's mill at Cramond, established by the Cadells in 1815.³ They already had paper making interests at Auchendinny and Saltoun. Loch mill, a mill still in

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1. Pigot's Commercial Directory 1820 and the 1825 excise number list.
 2. Derived from Collectors' States of Accounts.
 3. N.S.A. Vol. 1, p. 600

operation, was being run in 1820 by Kilgour and Paterson¹ - a partnership which was at that time also operating Balerno mill. Blackburn mill, occupied in 1825 by Adam Manson, was a short-lived concern as was an un-named mill with the excise number 61 operated in 1825 by Joseph Crawford.² The fifth new mill in this Collection was a conversion or re-conversion - Adam Brae at Midcalder. Originally built by John Mitchell of Alderstoun for grain and possibly subsequently used for paper, it was in use by John Johnson for paper in 1825.³ The last two mills to be noted, certainly lasted longer than some of the others. Leith Head, operated by George Gourlay in 1825 was still a going concern in ~~1832~~ after which it became a farm.⁴ New mill, West Calder, was occupied by John Gray in 1825 and was still working in 1860.⁵ As already indicated some of these mills had a somewhat brief existence, but from the excise figures it seems likely that some were established early in the century. The average, after the start of the Stirling Collection, was 6.4%. With the nominal existence of eight mills this may not seem very large but it shows that at least up to 1825, there was a place in the

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1. Pigot's Commercial Directory 1820.
 2. Both in the "1825" list - see Appendix p. 329.
 3. Pigot's Commercial Directory 1825 and McColl - History of the parish of Midcalder, p. 41.
 4. The "1825" and O & B and R.W. lists. Also information from Mr. Robert McNeill, "The mill is now a farm and is near Kirknewton".
 5. Edinburgh Directory for 1825-6 (Country section) and the 1860 Paper Mills Directory.

industry for the small mill - that the demand and price of paper were such as to render the small mills still economically viable. In the outlying area round Kilmarnock, another mill was started between 1800 and 1825. It was also at Galston, and Alexander Pedden is listed as being there in 1820 and up to 1823.¹ Nothing has been found of its previous or subsequent history. It does not figure in any of the mill lists, and the excise figures for the Ayr Collection are of no help for the remarkable rise (tenfold) for the years 1822-1824 due to the closure and transfer of the Paisley Collection, entirely masks any changes due to the start or closure of one small mill.

The Dumfries Collection, embracing Kirkcudbright, saw the addition of three and possibly four new establishments. At Dalbeattie, a second mill was started and in 1825 was occupied by James Houston. Like Mount Pleasant, it had two vats and was still operating in 1837 but its date of commencement has not been traced.² In Dumfries a mill is listed from 1812 when it was carried on by a Mr. Chalmers. A bookbinder of this name took three apprentices in 1792, but any link is conjectural. From 1820-1823 the name listed is J. Carruthers. In 1825 the name "Colzer Mill" appears, run by Douglas Kirkpatrick and Co., but it is the only Dumfries mill listed and may or may not have been a new one. The fourth possibility is a mill at Langholm, reported

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1. Pigot's Commercial Directory.
 2. Ibid and the 1837 edition.
 3. P.R.O. IRI vol. 67, Pigot's Commercial Directory, and the "1825" list.

by Dr. Singer in the Agricultural Survey of Dumfries as having two vats, employing 29 workpeople and producing 80 reams per week. The work however had been discontinued and he was writing in 1812.¹ It is possible therefore that this mill was an eighteenth century foundation. The excise figures show an increase from 1807 and there is a drop in 1812 with recovery in 1813. A further increase occurs in 1817, so it is possible that the Langholm mill had a brief existence from 1807-1812, with the Dumfries mill following on. The Dumfries Collection contribution up to 1807 averaged under one per cent. From then till 1816 it was 2.3% and up to 1824 2.7%. Taking into account the rising national output, this shows the area to have been supplying a considerable quantity of paper, some of which no doubt was supplied to Carlisle.

In Berwickshire, the Allanbank mill on the Blackadder at Edrom is listed as occupied in 1825 by Peter Wintour.² Its starting date has not been noted and the excise figures show a lower average from 1812 onwards of 8.6% compared with the previous run of 12.7%. The Collection was merged with Haddington, always the largest, in 1825, which makes further deduction impossible.

1. Agricultural Survey of Dumfries, p. 420 Edinburgh 1812.

2. 1825 list see Appendix p. 329.

The three other mills started in this period established a new area - that of Fife - and they are still in operation. Pride of place goes to Rothes, which was built by Archibald Keith (of Newbattle) for his son William. Unfortunately William died before the mill was finished and the lease was signed and was taken in the name of Archibald Keith (junior). Production started in 1806. He became bankrupt in 1810 and the mill was subsequently sold to Thomas Whyte. It continued in production as a two vat mill until he too became bankrupt in 1816 or 17. His colleague David Lindsay took over and was still there in 1825.¹ In 1809, Robert Tullis, printer and publisher of Cupar, acquired a meal mill lately occupied by James Strothach and converted it to paper making.² This mill, Auchmuty, started production in 1810. The third and last of this Fife group of mills was a two vat mill at Balbirnie, started in 1816 by Alexander Grieve who had been Tullis' manager at Auchmuty.³ This group of mills constituted the Fife Collection and from the excise figures, the start of each mill can be observed. If the average output per mill in this area was a

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1. O.S.P. 502.65 and N.S.A. Vol. IX, p. 672, also the "1825 list
 2. Rothmill Quarterly Vol. XXX No. 2, p. 71
 3. Ibid and N.S.A. Vol. IX, p. 673.

little below the national average at this period, it is surely because these were all new mills whose development was to come mainly with the introduction of the machine. Many of their competitors in other areas, having been long-established, had expanded their numbers of vats over the years.¹

From all that has been shown, it seems that prior to 1700 paper-making had been carried on or attempted in areas based on Aberdeen, Berwick, Glasgow and Edinburgh. All of these areas developed in the century to 1800 and continued to 1825, which can be taken as a date after which the paper making machine became dominant in the country. Its early effect in Aberdeen and on the Esk has already been noted. The small seventeenth century area round Haddington did not develop and was really defunct before 1825.

During the eighteenth century the most important paper producing area, centred on Pennycuik and the Esk Valley, was established, and continues paramount to the present day. Other areas to arise were in Perthshire, in Stirling and Clackmannanshire, round Linlithgow, and in Fife. All of these are still in production, but the Perth Collection ceased in 1825, the mills being transferred to the Stirling and Fife Collections. Of the isolated mills, only Kilmarnock is still in operation, though the present mill is a later foundation than is covered by the period under review.

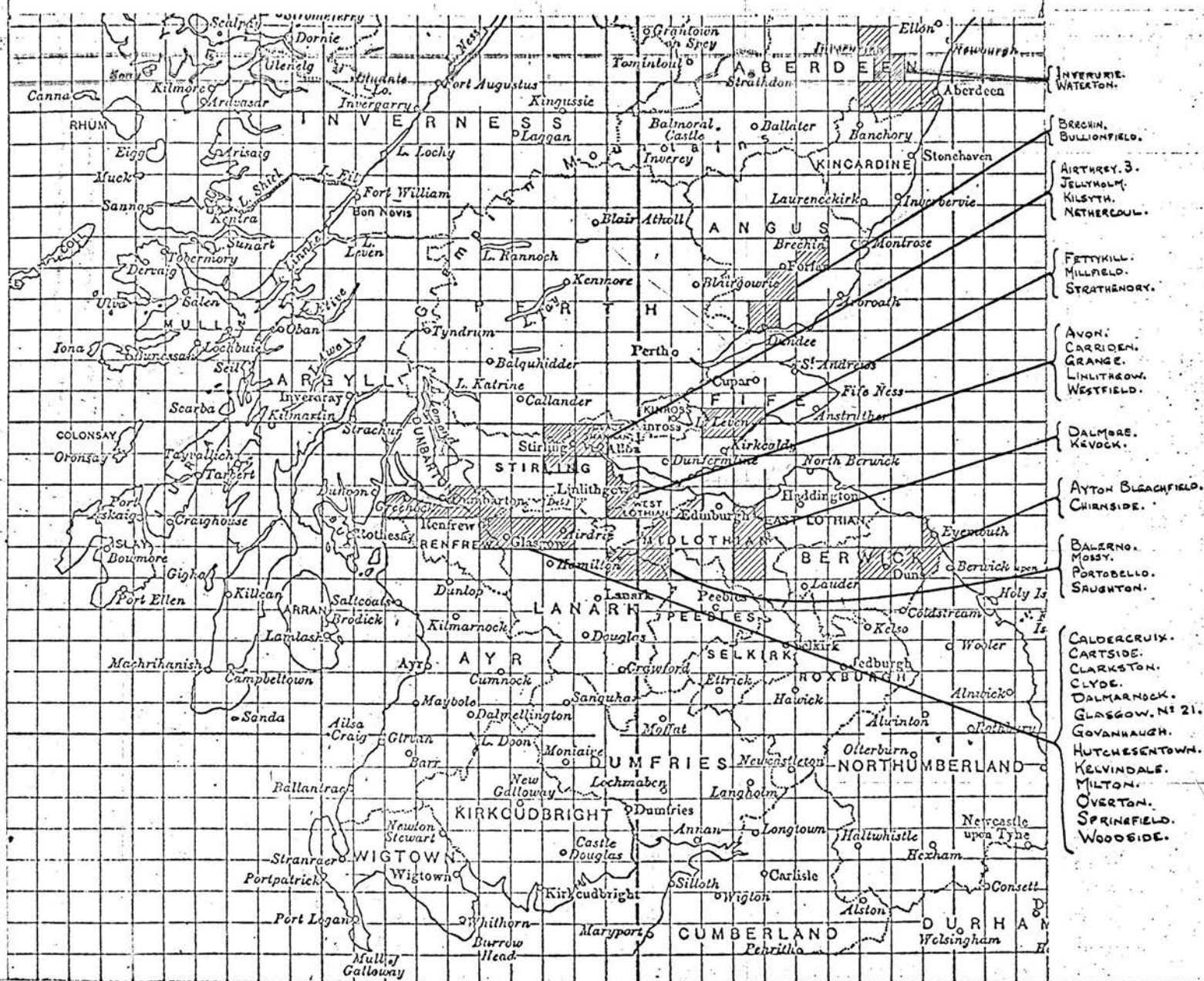
1. Derived from S.R.O. Collectors' States. of Accounts. The average percentage of the national collection contributed by Fife from 1817-1825 (and in 1825 itself) was 3.2. The number of mills licensed in 1825 was 64 so that the average percentage contribution per mill would be 1.56. Hence 3.2% for three mills is somewhat below the national average.

The date 1825 has been chosen to mark the end of the hand-made era in Scottish paper making. It is clear that the changeover to machine made paper must have been gradual: no one year can be found to mark a complete changeover, and the matter is dealt with in another chapter. The first paper making machine in Scotland was installed in 1809 or 1810 at Peterculter.¹ In 1812, however, the mill was advertised to be sold by public roup.² It was not sold then and after various "accommodations" carried on till 1820, but even then the sale was not made for a whole year. From this it is clear that though the machine may have been capable of great output, it did not, in this case, make a decisive change. According to Gillis, there were 13 machines in Scotland by 1825,³ and Cathcart is given as the producer of the last hand made paper in Scotland - in 1873.⁴

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1. W. Cormack Our Ancient & Honourable Craft and Gillis W.P.T.R. 18 Oct., 1912 and W. Cormack in the Deeside Field 1933. The licence to use a Fourdrinier machine was issued on 1st July, 1807. Dr. Skene Keith (quoted by Cormack) gives 1811 as the beginning of machine made paper. Mr. Fraser Geddes (presently at Peterculter) was examining the files of the Aberdeen Journal, found the first issue to be printed on machine made paper was 26th August, 1812.
 2. Aberdeen Journal 8th January, 1812, Our Ancient & Honourable Craft and Aberdeen Journal 16 Feb., 1820
 3. Gillis W.P.T.R. 18 Mar., 1913.
 4. Waterston B.O.E.C. Vol. XXV.

Mills established 1825-1861

Cverton (Greenock)		1827
Townhead (Kilsyth)		1827
Carrongrove		1818 or 08
Grange (Mid Calder)		1830
Waterton		1830
Airthrey No. 3	c	1832
Balerno		1832
Balerno Bank (New)		1832
Clarkston		1832
Hutchesentown (Govan)		1832
Jellyholm (Alloa)		1832
Linlithgow		1832
Nethercoul (Auchterarder)		1832
Saughton		1832
Westfield (Bathgate)		1834
Portobello		1836
Mossy (Colinton)		1839
Ayton Bleachfield		1842
Chirnside		1842
Dalmore		1843
Kelvindale		1845
Springfield (Glasgow)		1847
Caldercruix		1848
Fettykill (Levenbank)		1848
Bullionfield		1850
Port Dundas (Cartside)		1850
Brechin (Angus)		1851
Glasgow (St. Enoch's Wynd) 21		1851
Kevoek		1851
Woodside (Glasgow)		1851
Carriden (Linlithgow)	c.	1842
Milton's (Bowling)		1852
Clyde (Rutherglen)		1856
Dalmarnock		1858 or 5
Inverurie		1858
Avon (Linlithgow)		1860
Glasgow (Govanhaugh)		1860



PAPER MILLS STARTED BETWEEN 1825 AND 1861.

Aberdeen	1825	12.4	1.06	1.7	3.2	14.8	35.2	6.7	5.6	7.6	11.4	1825
	6	11.1	1.1	1.9	3.4	16.6	36.3	6.4	6.4	7.7	8.7	6
	7	13.8	1.6	1.9	3.9	15.7	40.5	5.9	4.7	6.4	5.5	7
	8	12.2	1.5	1.7	5.4	13.2	43.8	6.7	3.6	6.0	5.9	8
	9	10.5	1.0	1.6	5.1	13.4	41.0	7.0	2.4	8.7	9.3	9
	1830	11.2	3.3	1.3	4.2	12.4	40.7	5.4	2.1	6.8	12.7	1830
	1	11.5	3.8	1.0	4.3	14.1	39.8	4.2	1.5	6.0	13.7	1
	2	10.8	3.5	1.0	4.3	13.4	34.7	2.5	1.4	5.5	11.6	2
	3	11.0	4.4	0.54	4.6	11.1	36.7	2.8	1.1	4.7	12.8	3
	4	11.5	3.9	0.3	4.6	10.3	36.4	4.0	1.1	4.1	12.1	4
	1835	10.7	3.7	0.27	4.7	10.5	32.7	3.4	0.1	4.5	9.5	1835
	6											6
	7											7
	8											8
	9											9
	1840	10.6	3.3	0.22	8.9	9.7	37.7	4.8		8.4	16.4	1840
	1	13.3	3.2	0.22	8.3	9.6	44.0	4.1		6.5	16.2	1
	2	15.1	3.4	0.2	8.5	11.8	36.4	4.2		5.7	14.9	2
	3	13.8	2.8	0.17	8.7	11.3	40.0	4.1		6.0	15.5	3
	4	11.9	2.6	0.18	7.8	11.2	40.5	4.2		7.0	14.6	4
	1845	12.6	2.7	0.18	6.1	9.4	42.5	5.6		7.6	12.6	1845
	6	12.8	2.6	0.19		10.2	40.0	10.1		7.4	14.3	6
	7	13.5	2.1	0.18		11.3	38.2	10.0		10.2	13.7	7
	8	14.1	3.1	0.15		12.5	37.6	9.0		9.1	12.6	8
	9	12.4	2.6	0.15		12.7	39.0	8.9		11.5	12.4	9

% Contributions from each Collection to the Gross Product for Scotland
in the period 1825 - 1849

(figures for 1836-39 and 1850-61 not available)

Thus in about 50 years the Fourdrinier machine became completely dominant in the industry but in the whole of the first 230 years of its existence, the Scottish Paper Industry followed the hand-made process. 1825-1861, the last 35 years - the machine-made generation.

Brief consideration will now be given to the mills started between 1825 and 1861. All but three of them fit geographically into the eight areas already established. Upwards of forty mills seem to have been started during this period. The number of licences issued in 1823 was 62, but after 1830 there was a sharp fall to 54 in 1831, and to 43 in 1833. From then till 1861 the average number was 43. Clearly therefore there must have been a great many closures during the period. Many of these were small mills which experienced strong competition from machine-made paper. In some cases, in order to meet this challenge to their existence, local operators took over a second mill. Combining the best features of each and concentrating production at the more convenient mill, they improved their economic position and survived, at least for a time.¹

By far the largest of the mills to be started in one group was in the West, centred on Glasgow. This area ranged from Birdrie to

1. Gillis W.F.T.R. 8 Nov., 1912. In 1832 Wm. Lewis was at No. 43 Dalbeattie and Elizabeth Wilson at No. 45. In 1845 No. 43 had closed and Lewis was at No. 45. Ibid 1 May 1914. McRobie started Arthrey 3, No. 71, but subsequently moved the machinery to his other mill Arthrey No. 2, No. 48, where he concentrated his work.

Paisley, a distance of about 23 miles.¹ The other seven areas all saw new mills started, though in Aberdeen there were only two, that at Inverurie (1858) being the most remote in the district. The area however continued to produce about 12.4% of the Scottish gross product, at least up to 1849. In the same period the Glasgow Collection was about 1% below this, but for a true assessment of the position the Ayr Collection should be added to that of Glasgow. When this is done the somewhat surprising result is that although from 1826-1835 the combined Glasgow and Ayr return is 4% greater than that from Aberdeen, from 1840-49 the difference is only 1%.² This is partly explained by the installation of a second machine at Mugie Moss in 1844, making a total of 6 in the area. There must also have been economic advantages in the small number of firms operating in the Aberdeen area.³

Paper making started in a new area, in Angus, in this period. The mill at Bullionfield, Invergowrie, started by Alex. Cowan in 1850⁴ was taken over by their manager there, David M. Watson. The mill

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1. These two towns were both served by Glasgow Corporation transport so the area has a measure of unity.
 2. S.R.O. Collectors' States. of Accounts (derived). Also Loftus Inland Revenue Almanak for 1854 gives Dumbarton, Greenock and Paisley as in the Ayr Collection.
 3. After 1840 Alex. Pirie & Sons of the Stoneywood mills took over Peterculter. Chas. Davidson & Son had Mugie Moss and Bucksburn.
 4. Excise General Letters, G.O. 16 May 1850.

expanded and carried on till January 1965 when it was closed due to group reorganisation. The other mill, at Brechin, was started in 1851 and was still operating in 1885.

On the whole, then, the mills started between 1825 and 1861, almost exclusively machine mills, did not break fresh ground. Surprisingly they did not greatly change the relative productive importance of the areas. This fact would seem to be explained by the dominant position attained by those firms which had developed most vigorously in the hand made era. From their position of strength, both financially and in the London and world markets, they expanded further in the machine period. During this time newcomers found it difficult to dislodge the well-established concerns, though they were quite able to secure a small share of the rapidly expanding market.

Review of the factors governing the distribution.

The geographical distribution of the mills would initially be determined by an available water supply, both for motive power and for process work. In all the areas which developed, this supply of water was available in abundance, but in East Lothian, in parts of Berwickshire and Kirkcudbrightshire the streams do not seem to have been adequate to sustain an output in excess of that produced by a two or perhaps three vat mill. Another factor, which had to be considered in this connection, was the terms offered by the landowners. The great development in the Esk Valley was in part due to the water facilities, in part due to the proximity of Edinburgh, but the continuing interest of the Clerks of Pennycuik, did a great deal to foster the development from 1708 onwards.

as instanced in the finance chapter, the interest was not confined to paper, and in a case against Wm. Annandale in 1783, Sir John Clerk renounced his legal claim, 'to encourage the .. paper making'. This attitude stood in strong contrast to that of their neighbour with whom the Craigs of Newbattle were unable to agree - finally removing their mill altogether to other premises near Lirdrie.¹ In the very early days when a one vat mill was an adventure of some risk, since even £200 would not be lightly come by, the comparison with the numerous corn mills throughout the country, would encourage the paper makers to start on almost any stream. When expansion was desirable, it was found that many of the sites were inadequate or seasonably unreliable. Thus in the heyday of the hand made era, only the major streams were found capable of sustaining the expansion. Many small mills continued as small mills on their limited water supplies. They supplied small local needs with low transport costs, and often the quality was poor. When greater expansion came with machines and steam, these small concerns were unable to finance the changes. Thus it is that the large present-day enterprises are on the larger and more adequate waters, which had enabled expansion to occur in the hand made era. The larger scale of their operations enabled them to finance further expansion.

1. .. century of paper making Robert Craig & Sons, Ltd.,
Edinburgh 1906, p. 14.

A second major factor in the initial siting of mills was the availability of a good market. In the earlier years, this would be of considerable importance, when long-distance transport was not as reliable and regular as it was later to become. However, not too much emphasis must be put on this aspect, since there was a considerable amount of shipping, while land transport also existed for the general commerce of the country.¹ However, when starting a mill, the proximity of a local market would be necessary, at least until any period of expansion set in. Only then would more remote markets become important. In many cases, mills were set up by printers, newspaper proprietors and publishers, initially to supply their own requirements.² Some of these developed to such an extent that their local market became, to them, quite subsidiary to the London market. It may perhaps seem surprising at first sight, that, for example, Aberdeen could compete successfully in the London market. Sea transport however was not expensive,³ adding only about 1% to the wholesale price of paper.

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1. In the Almanaks long lists of Carriers and their places and days of arrival and departure were given - e.g., in the Edinburgh Almanak of 1819 there are 380 such entries covering 262 places with regular arrivals and departures from various addresses in the city.
 2. Examples are: Richard Watkins (printer and publisher) at Valleyfield 1717-47, Walter Riddiman (Caledonian Mercury), Robert Fleming (Edinburgh Courant) and John Aiken (Bookseller) at Springfield in 1742, also Alexander Brown (bookseller) and James Chalmers (printer and publisher of the Aberdeen Journal) at Craigbeg Ferryhill, and Robert Fullis (printer and publisher) at Auchmuty.
 3. In 1806, the shipping cost 6d. per bundle from Leith to London.

Confirmation of this low cost was shown by the presence on the British market of European paper at competitive prices. The determining factor was not so much the absolute cost of the transport, as the amount relative to that paid by competitors in the trade. Thus a comparatively short land journey might add an amount per ream equivalent to that added by considerably longer sea or river transport.¹ As the industry developed, the London market became more and more important and as transport facilities improved, the actual siting near towns such as Aberdeen, Berwick, Edinburgh, Glasgow or Perth for market purposes, became less important than for the port facilities they offered.² The local markets, though still useful, called for a wide variety of qualities but small supplies: the larger, and particularly the London market, called for longer runs and so led to a measure of specialisation.

A third factor in determining the siting of the mills was the availability of rags. Now just as in the initial stages of a mill

3. Contd.

34 bundles were sent, costing 17/-. The bundles contained 102 reams of Coarse Demy at 16/- per ream. At 17/- for freight the additional cost is 2d. per ream or app. 1%. (Taking 20 lb. per ream the freight comes to app. 18/6 per ton). Esk Mills Documents, Letter 29 Nov., 1806, to Magnay & Pickering, London.

1. In 1842 the cost of transport from Glasgow to Fife for bags of cotton waste was approx. 18/- per ton. At about the same time rags were shipped from London at 11/- per ton. Paper at this time was 16/6 per ton from London. Tullis Russell Memo Book pp. 17 and 40.

2. Morison's Perth and Perthshire Register for 1849 lists 88 vessels registered at The Port of Perth.

the amount of water power available from quite a small stream would be adequate, and the market provided by the local large town would be sufficient, so the supply of rags locally available would suffice. As the industry expanded, shortages became evident. The broadsheet issued about 1760 by Robert Taylor, proprietor of Broomhouse mill, and various press advertisements in 1751 and 1771¹ indicate the growing problem. In 1755 on Monday, 7th April, was held the first meeting of the Edinburgh Society for encouraging Arts, Sciences, Manufactures and Agriculture in Scotland. The primary activity of this Society was offering premiums and prizes for Scottish workmanship.² In the first list, which contained 23 items, prizes were offered for the collection of linen rags for paper making. In all, five such prizes were offered, ranging from 70/- to 10/- and in the event awards were made of the first four prizes. The quantities and qualities were certified by

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1. Aberdeen Journal 8 Jan., 1751 Bartholemew Smith ... buys rags of all kinds, of Flax or Hemp, by the stone weight ... Mr. Smith expects that ... every person will be careful to save these materials for his work which formerly were thrown away.."
Ibid. 18th Feb., 1771 John Boyle and Richard Hyde .. give .. 9d. for every 20 lb. of old ropes or unbleached rags and 1/6 for linen or checks rags .
 2. For a full account of this Society see McElroy "Literary Clubs and Societies of Eighteenth Century Scotland" Edinburgh University Ph.D. thesis 1952. Also appendix p. 343.

the paper maker supplied and the activity of the Society indicates to some degree the need for encouraging rag conservation. However, the seriousness of the problem is much more clearly demonstrated in succeeding years. In 1756 prizes of 2 guineas and one guinea were offered to the gatherers of the greatest and next greatest quantities of "superfine rags of muslin, cambrick, lawn and finest linen ... worth 5 shillings per stone and upwards . Also one guinea was offered for ' fine rags ... linen, cotton, muslin .. worth from 3 shillings to 5 shillings per stone . None of these sorts of rags was produced for prizes. The next group"... worth from 14 pence to 6 pence per stone also carried a prize of one guinea and this was awarded. In subsequent years the deficiency in the higher qualities persisted and though in 1758 the winner in one class collected over 600 stone, the awards in 1763 and 1764 were for as little as 55 stone.¹ Thus it is clear that the local supplies of rags were becoming less plentiful. It may be that the "trade" was becoming more organised, but this does not become clear till a later date. One, John Leechman, was a rag dealer from 1774, James Moffat from 1780, and George Taylor from 1787,² but such men's prices would not be appreciably better than mill prices and the Society's premiums would be worth many stones of rags.

1. Scots Magazine Feb. 1756 and Jan. 1757 also Jan. 1758, April 1759 and Caledonian Mercury 27 April 1763 and 9 April 1764.

2. O.S.P. 206.8

YEAR	GERMANY	HOLLAND	IRELAND	ITALY	MALTA	NORWAY & DENMARK	POLAND	PRUSSIA	RUSSIA	SICILY	TOTAL
1762	1,496					290					1,786
1775	874						189				1,063
1776	994										994
1777	1,132										1,132
1778	838										838
1779	130	10									140
1780	312	15									327
1781	231										231
1783	552										552
1786	610			240							850
1788	1,470			5,700			45		31		7,170
1789	469			10,281							10,826
1790	1,716	40		7,516							9,272
1791	1,640	20		16,313				25	247		18,220
1792	2,230	14		8,366					414		11,049
1793	4,804			9,586					420		14,390
1794	6,915			7,415							14,750
1795	5,819			1,750							7,569
1801	3,202		943	1,124			120	2			5,391
1806	8,762		28	162	1,952	1,269		322		3,955	16,450
Total	44,196	99	971	68,453	1,952	1,559	354	349	1,112	3,955	123,000 cwt.

IMPORTS OF RAGS INTO SCOTLAND

(S.R.O. Accounts of imports and exports P.H.20 (20 vols))

To meet the need for rags, importation from Europe, especially from Hamburg, was early resorted to. In 1782/3 just under 90 tons came in, mainly by Leith. From then till 1806/7 the amounts varied considerably ranging from as little as 7 tons in 1779/80 to over 900 tons in 1791/2 and averaging over 300 tons per annum of the whole twenty year period.¹ (See table). This importing continued and according to Spicer,² there was governmental encouragement of rag imports after the Napoleonic war. Exports by France, Belgium, Holland, Portugal and Spain were then prohibited and subsequently an export tax was imposed in those countries. The whole matter of rag supply was the subject of a Government enquiry in 1861³; the ultimate solution by Esparto and Wood Pulp is outwith the period of this study.

One interesting rag enterprise in the eighteenth century was the establishment in Edinburgh of the General Rag Warehouse in 1793⁴. It lasted till Whitsunday 1798 and in the five years laid in rags to the value of just under £40,000 representing about 2,750 tons per annum. This warehouse was set up by a consortium of paper makers to safeguard supplies and to preserve continuity. All this was in addition to as much local supply as could be obtained and this source expanded towards the end of the eighteenth century due to the availability of waste from cotton and linen mills. This was not of itself enough however. The Esk mill, Pennycuik, established originally as a cotton mill, had paper subsequently added on the same premises.

1. S.R.O. Custom records R H 20 Vols. 1 - 20.

2. Spicer A.D. The Paper Trade pp. 26, 27.

3. B.C.P. 1861. XL.

4. O.S.P. 206.8.

In the period Aug. 1805 - Aug. 1808 the proprietor of the double enterprise bought rags to the value of just under £900, in addition to his on-the-site supplies. The carriage paid for these from Leith was small, being 4¹/₂d. per cwt.,¹ so that the area was not at a great disadvantage in this respect, and continued the dominant area.

In the court case in which the Leith rag dealers mentioned above were cited, the chief point made, was that these men had all been in the practice of buying rags in categories according to their use and value to paper makers. Thus are mentioned Superfine, fines, seconds, blues and greys. Subsequently many other grades were recognised.² The price ranged, round 1790, from 7/- to 8d. per stone and this ratio of about 10: 1 from superfines to the poorest sorts was still quoted by Tullis in 1842, though by then the prices were about half those of 1790.³ During the war, in 1808, the price was considerably advanced, due mainly to the closing of the European ports. Fines, which had sold for 4/0 per stone in 1788, 4/3 in 1791 and 4/6 in 1793 were advanced to 10/-. This was the principal kind imported from Hamburg. Seconds, which were available more locally, showed a smaller advance: from 1788-93 they sold at 1/6 per stone and in 1808 were fetching 2/2.⁴

4. Contd. C.B. 1. 18.1

1. Esk Mills documents.
2. Tullis Russell's Memo. Book. Rags 1842, Fines, etc., plus Dark Blue, Checks, Light Blossoms, Dark Blossoms, Bagging, Frills, Ticking, Good Reds, Pale Reds, Blacks, Greens, and Jean (or Jane) Bodies.
3. Ibid.
4. Esk Mills Letter Book 4 May, 1808, Letter to Archd. Keith.

This high price in 1808 seems to have been a peak, as the ports of Hamburg and Bremen were opened, at least for some commodities, in October of that year. In August 1806 fines were £30 per ton at Leith, in 1807 £35 per ton (4/5 per stone) and £22 per ton (2/9 per stone) for poorer qualities. It should however be noted that the price per ton was a bulk price. In the cases quoted above, the high (1808) prices per stone were paid for amounts of the order of 8 cwts. (64 stone) and no "per ton" price for these is known. Nevertheless it seems clear that the prices did rise up to the end of 1808 due to the unusual shortage caused by the war.¹ Although many rag purchases have been noted after this date, no quantities are listed. In 1842 a full list of prices is available, and these quoted, in each comparable case, lower prices than in 1808. Fines were 17/- and other sorts ranged down to 2/6 per cwt.

The other factor which might be thought to influence the distribution of mills would be the availability of suitable labour. In the very early days most of the paper makers came from furth of Scotland. At Dalry by 1594 there were Pietter Groot Heres, Michael Kysar and John Seillar from Germany. Just on a century later Peter Breusch, also a German, was at Restalrig. Then the Frenchmen de champ (Dalry and Cathcart), Dupyne and de Manes (Braid and Yester)

1. Esk Mills Letter Book - various letters, 24 June 1805, 2 Aug., 1806, 11 Oct., 1806, 4 Sept. 1807 15 Sept., 1807, 4 May 1808., 5 Oct., 1808.

specifically agreed to train ten apprentices.¹ Almost certainly from England, came Richard Watkins (Yester and Valleyfield), Edward Collins (Dalmuir), Bartholemew Smith (Peterculter), and later Alexander Annandale (Polton) and Ebenezer Martin (Ayton).² These men were doubtless able to train local men to the various jobs required. Some of the work was essentially unskilled, as for example rag sorting and cleaning, press operation and hanging the paper to dry and even counting, picking and packing. Of considerable skill were the jobs of vatman, coucher, layer and sizer, yet none of these needed greater applied skill than would be required of a good cabinet maker, weaver, coach builder or silversmith. Such jobs would be well within the capabilities of the intelligent journeyman or apprentice. Some records of apprentices have survived and if the names do not subsequently appear as those of mill operators, it is probably because most of the workers in paper-making, as in other industries, remain anonymous.³

1. See chapter 1 also S.R.O. Register of deeds Durie Office 4 April, 1698.
2. For Watkins see S.R.O. Edinburgh Commissariat 3 Nov., 1747 and Waterston B.O.E.C. XXVII p. 47 & XXIX p. 190. For Collins see S.R.O. Collins papers file T/302 and information from Kelvindale. For Smith see Aberdeen Journal 8 Jan., 1751 "Bartholemew Smith, paper maker from England .. has now erected .. a paper mill .." Alexander Annandale from Shotley Bridge nr. Newcastle bought Polton mill in 1798. See Cairns "Bright & Early" p. 147 & Gillis W.P.T.R. 24 Jan., 1913. Ebenezer Martin, son of Thomas Martin, of Wood Mills, Leeds, came to Ayton Millbank. His two brothers, William and Robert, operated mills in England. Information from Martin family.
3. P.R.O. Apprentice Books I R I Vol. 60, p. 92, Vol. 63 p. 219 and Vol. 65 p. 96 record 5 apprentices taken by McLachlan at Tongland in 1774, 75, 86 and 88. Vol. 63 pp. 9, 41 and 220 record 7 apprentices taken by Taylor at Broomhouse in 1783, 84 and 85. Vol. 67 p. 26 records one apprentice taken by McCochtrie at Dalbeattie in 1793.

Two recent articles by an "amateur paper maker" show the possibility and pitfalls of making paper by hand.¹ Yet it seems clear, that in widely scattered areas of Scotland, were found men capable of the art of paper making. In the Old Statistical Account are recorded 3 paper makers at Galston, near Kilmarnock, a number small compared with the 55 weavers, 21 shoemakers, 11 wrights, 11 taylor and 9 masons in that community.² Thus among the skilled men of Scotland it seems that the availability of suitable labour was not a limiting or even a major factor in determining the location of hand made paper mills. In the Court of Session on 29th June, 1798, counsel for John McNiven stated the position, perhaps colourfully, but with what certainly seems to have been some truth. "In the business of paper making", he said, "there is no mystery in the manufacture of that commodity; and any person, of capacity superior to a changeling, can make himself familiar with the whole steps and process of it, in a very short period of time". (sic).

Information on the cost of available labour is not plentiful, nor is it well distributed through the period. Total wages bills for mills are more common, but in the absence of information on the labour force at the particular mill, this too is not as useful as one could wish. However, it seems likely that the paper makers' wages were comparable with other craftsmen's. The pre-1800

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1. Morris Henry M. 'Confessions of an amateur paper maker and Hand paper making as a hobby'. , The Papermaker Vol. 33, Nos. 1 & 2.
 2. O.S.A. Vol. II, pp. 79 & 82. Ibid Vol. V, p. 344 gives similar information for Cathcart. 5 paper makers.
 3. O.S.P. 391 No. 74 p. 2.

information is not always consistent, for at the two vat Herbertshire mill for the year 1796, wages and rags account for practically equal amounts of nearly £1000 each.¹ The affairs of Nisbet and McNiven, at their six vat mill at Currie, show that in the year 1792 wages were £1,140 but rag expenditure amounted to £4,450.² This does not seem to be satisfactorily accounted for by the difference in size of the mills. For the period 1806-1814 detailed wage sheets are available. At the opening, Vatmen earned 2/6 per day, in March 1806 there was a rise to 2/8 and in April it was 2/10. This rate was held till March 1809 when a further 6d. was added, making a total of 3/4 per day, a rate held till the end of the book in 1814. The wages were £4 for four weeks which was the usual pay period. The vatman was the highest paid craftsman (only the Foreman of the mill had more). Couchers were consistently paid one penny per day less and Dryworkers a further penny less. These rates, for Valleyfield mill, were sometimes a little higher than at the other Cowan concerns (Lasswade and Bank mills) but they indicate the order of remuneration paid to the top skilled men of the trade. The rag women were paid according to the weight and type of rags which they cut. The highest daily amount seems to have been 1/3 with 9d. or 10d. a usual average. In the smaller mills in the

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1. Herbertshire Documents. Letter from Gilbert Laing to George Jeffrie dated 8th Dec., 1796 gives "... Paid for rags to that date after deducting the value on hand £969: 3: 7 ... Wages to men and women to that date £987.
 2. O.S.P. 206 No. 8 and 397 No. 8 (Appendix).

country parts the wages were lower. In the Auchterarder, Bridge of Allan and Crook of Devon area, in 1812, the Vatman was paid 2/4 to 3/- per day. Couchers, Engineers and Finishers received from 2/2 to 2/8. The apprentices got from 3/- to 10/- per week. In 1819 one man working as an engineer was paid 1/6 and in 1821 as a coucher 2/3. In 1827 he joined another mill as vatman at 2/4 per day.¹ These wages, both for a large and important mill and for the smaller country concerns, were not high. (They were lower than in England² and some attempt was made to recruit Scottish paper makers during an English strike in 1796). On the cost and availability then of suitable workmen, the paper making proprietors in Scotland were not greatly handicapped, or advantaged, by particular geographical locations, since the lower rural wages would be off-set by other costs such as transport both of rags and of the paper itself.

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1. M.R. Kennedy. Reminiscences of a paper maker in the early nineteenth century. The American Paper Trade Journal 1885. In 1812 M.R. Kennedy was apprenticed to a one vat mill at Auchterarder where they employed 5 men besides.. weekly wages Vatman 14-18/-, Coucher 13-16/-, Engineer 13-16/-, Finisher 13-16/-, Apprentice 3-10/- .. after 7 years he .. went to McCrovey's mill at Bridge of Allan .. on engines at 9/- per week, was 2 yrs. on engines then couched for 5 yrs. at 13/6.. we were out of employment for one year and then went to Crook of Devon as vatman for 14/- per week.
 2. Coleman D.C. The British Paper Industry p.263 and footnote

Consideration of the distribution of the mills shows a pattern which broadly followed the population distribution. This in turn seems to have followed the rivers and to have been situated mainly on the east coast, whence shipping to and from Europe and London came. In the west, of course, there was the rapidly-developing industrial area round Glasgow and, as might be expected, an important paper making area arose also. By 1824/5 there were 68 mills licensed in Scotland and the pattern was set. Subsequent expansion was in the areas whose rivers had proved their suitability in the hand made era. These rivers carried large and important concerns capable of financing the developments of the next forty years.

In the whole country it is not surprising that the greatest concentration of mills and production should have been within ten miles of Edinburgh. In the eighteenth century, the capital city afforded a market unrivalled in Scotland. Banking, Commerce, the Law Courts, Newspapers, Publishing, the University (and its press) together with the activities associated with the building of the New Town and the normal domestic use of paper, made insatiable demands for paper. From Leith, ample shipping facilities brought rags from Hull or direct from Hamburg and Bremen, while the coastwise shipping carried finished paper to London. During the period 1764-1800 the paper excised at Haddington and Edinburgh accounted for over 68% of the total of the country. During the years the figure rose to over 72% with a peak of 77% in 1772. Such figures were the result of unique combination of factors favourable to paper making in and around Edinburgh (including

the Esk Valley). As other areas were established and expanded the percentage of Scotland's output contributed by the areas round Edinburgh was reduced. By 1825 it was just under 40% but it remained the largest and most important production area in the country, as will be seen in the next Chapter when the impact of the papermaking machine will be considered.

CHAPTER SIX

The Beginning of "Endless Paper Making" 1825-1861

In considering the impact of the papermaking machine on the Scottish paper industry, three main questions arise. Firstly what was the papermaking machine and what was its relationship to other machinery and mechanisation within the industry? This involves consideration of the Holland beater, of steam and the steam engine and of other inventions arising before and after 1825. Secondly what were the reasons for the introduction of the papermaking machine? Were the labour troubles, cited by its inventor of sufficient importance to account for its widespread adoption in Scotland, or did the manufacturers simply see its use as a way to larger profits, or was its use the only way to meet the rising demand for paper? Finally there were the effects of the machine on the industry itself. These were far-reaching involving siting and structure, workers and wages as well as production, profit and prices.

When the word "machine" is used in the papermaking industry it is the Fourdrinier machine which is normally understood. This machine was capable of producing paper continuously and of indefinite length. There were however other types of early machines by Bramah¹, Cameron², Cobb³ and Dickinson.⁴ The second of these, because of its Scottish origin,

1. Patent No. 2840 April 1805.

2. Patent No. 4002 March 1816.

3. Patent No. 3084 December 1807 and No. 3580 July 1812.

4. Patent No. 3191, January 1809 and No. 3452 May 1811, No. 3839 Aug. 1814.

will be briefly considered later. It is doubtful if Bramah's invention ever realised practical application. The famous English papermaker John Dickinson's machine, as far as can be determined, does not seem to have come to Scotland until after its later development as a board machine. Dickinson placed greater reliance on secrecy than on patents and George Sellers reported that "... all his machinery was made at his own shops under the same rigid secrecy."¹ The appearance of the machine in America was regarded by Dickinson as little short of a theft by "... one of his most reliable and trusted employees (Lawrence) Greatrake." Sellers also reported that "he was very bitter on Gilpin for buying Greatrake to get his invention."² An American patent was granted to Thomas Gilpin in December 1816.

When the word "engine" is used in the same context it is the Hollander beater or rag engine that is understood. This Hollander was the key to the successful operation of any continuous-production paper machine. Invented about 1650³ it was brought to Britain about 100 years later⁴ and was in

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1. Both Bertram's Ltd. and James Bertram Ltd. report that they made no Dickinson machines and have no records of any in Scotland prior to "about 1870."
 2. Ferguson E. S. (ed). Early Engineering Reminiscences (1815-1840) of George Escol Sellers. Smithsonian Institution, 1965, p. 124.
 3. Voorn H. On the invention of the Hollander beater. The Paper Maker Vol. 23 No. 2 1956.
 4. The Universal Magazine (London) Vol. X (Supplement) 1752. The writer says "... lately instead of pounding the rags ... they make use of an engine ..." Also Chapter 2 p.63.

general use by the time the Fourdrinier machine made its appearance in Scotland early in the nineteenth century. From figures quoted in the Edinburgh Encyclopaedia¹ it seems that it took 40 of the old stampers or mortars twentyfour hours to reduce one hundredweight of rags to pulp. In the same time, one Hollander could prepare about twelve times this amount.² The Hollander then was ready, developed and well-tried. It enabled the large quantities of pulp to be produced which were needed to feed the new continuous-production paper machines.

On the other hand, steam power was not by any means essential to the installation of paper making machines. It was simply a different form of prime mover from the universal water wheel of the eighteenth century. However in 1803 there was a small and hesitant move towards the use of steam power in the Scottish paper industry. The first installation of a Watt steam engine in a Scottish paper mill was at the Devanha mill of Brown, Chalmers and Co. (Aberdeen). The mill started work in 1803³ and is usually taken to have been the first in Scotland to have a steam engine.

1. Edinburgh Encyclopaedia Vol. XVI. p 280.

2. These figures seem to be of the right order, for, taking 278, the number of vats given in the 1852 Government survey (P.P.1852 Vol. LI.), assuming a 6 day week and 65% efficiency to allow for mechanical faults and the losses from dry rags to pulp and then to paper and also assuming operation for 85% of the year, due to accidents, drought or other cause, then the total prepared on the above basis of 12 cwts. per 24 hours per engine, comes to almost exactly the known paper production for 1852.

3. A. Cormack. Our Ancient and Honourable Craft p. 23. Also in Birmingham Ref. Library, Boulton & Watt portfolio 235 et seq. give eight drawings of the engine. The earliest is dated July 1802. The engine was type D, bore 23³/₄ in stroke 5 ft. rated at 20 h.p.

Another mill, at Lasswade, probably St. Leonards,¹ has been found to have had a steam engine operating in 1803. This fact is recorded by Svedenstjerna in his account of a visit he paid in April or May 1803.² He wrote "... At Lasswade, on the road to Dalkeith, I arrived at a paper mill The Hollander which ground the rags, as well as the washing machine, were worked by a steam engine ..." As this was evidently not a Boulton and Watt engine, it was probably an early Scottish product following the expiry of the extended Watt patent in 1800. These and other early steam installations were usually additional to existing water wheels. No example has been found in Scottish papermaking however of the use of the steam engine to pump water from the tail race to sustain the action of a water wheel as was done at Carron Iron Works and at Boulton and Watt's Soho factory in Birmingham.³ Even as late as 1843, the Franks report shows ratio of steam power to water power of about 1:1.5.⁴ Table 1, prepared from the report, shows an aggregate of 153 h. p. steam derived and of 232 h. p. from water wheels at seven of the larger mills.⁵

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1. Esk Pollution Case, Notes by Accountant for the defenders p.13, "... The next mill is that of Lasswade, or St. Leonards ..."
 2. Svedenstjerna E. T. "Reise durch einen Theil von England und Schottland in den Jahren 1802 und 1803 ..." Translated from Swedish into German by J. G. L. Blumhof, Marbury und Cassel 1811, J. C. Krieger, p. 141. The date of his Lasswade visit is not given but his subsequent itinerary brought him to Keswick in June (p.177) so that April or possibly May is a reasonable estimate.
 3. Wilson P.N. Water Power and the Industrial Revolutions. Water Power August 1954 p.312.
Mantoux P. The Industrial Revolution in the Eighteenth Century p.325 "... it was found simpler to pump up water into a reservoir, and then use it to turn a wheel ..."
 4. Franks Report P. P. 1843 XV. (On children's employment).
 5. Ibid. Appendix A. This lists 12 mills visited but he gives details on only seven. Many of the mills not listed would have had no steam engine so that his quoted results give an exaggerated emphasis to the steam installations.

Table 1
SOURCES OF POWER (1843)

<u>Mill</u>	<u>Steam (h. p.)</u>	<u>Water (h. p.)</u>
Mossy	0	20
Dalmore	20	32
Dalmuir	30	20
Esk	20	30
Polton	25	20
Springfield	50	60
Valleyfield	<u>10</u>	<u>50</u>
	155	232

Thus though steam may have been very important, even dominant, in some British industries (as reflected in Matthew Boulton's letter to Watt as early as 1781 "... the people in London, Manchester and Birmingham are steam-mill mad ..."¹ it did not dominate the Scottish paper making industry even as late as 1861. In England too the comparatively old paper industry was slow to adopt the steam engine. Coleman attributes this in part to the remoteness of many mills from readily available coal supplies,² but this certainly did not apply to the majority of the Scottish mills. There had also

1. Quoted by P. Mantoux in The Industrial Revolution in the eighteenth century, p. 340.

2. Coleman D. C. British Paper Industry p. 113.

clearly been plenty of time by 1825 for the new motive power to prove itself, for, as already mentioned, Watt's extended patent expired in 1800. One possible reason against its more enthusiastic use may well have been the very large size of the early low-steam-pressure beam engines. These required their own engine house into which they were structurally built - as well as room for the steam-raising boilers. Then the slow-speed engines were much less steady in their going, that is, their torque was not steady throughout the revolution of the shaft. This applied only slightly less to Watt's "sun and planet" notion (which gave two revolutions of the shaft for each stroke) than to the crank arrangement. The fuel costs too must have weighed with those contemplating change if they had water rights on a reliable stream.

Anders Jespersen makes the interesting suggestion that Scotland's water power potential was greater than that of England in the early nineteenth century, and certainly the water power resources of Scotland were by no means fully developed by 1800. In 1827 Finlay's cotton mills at Catrine had two 250 h.p. water wheels installed.¹ The example also of the Shaws Water Company, Greenock, started in 1825, emphasises the point even more. At its outset, the Company offered 1843 h.p., said to be more power than the total installed steam power in and about Glasgow.² As late as 1853

1. Wilson P. N. Water Power and the industrial revolution. Water Power August 1954, pp. 313, 314.

2. A Brief Account of the Shaws Water Scheme and present state of the works. Columbian Press. Greenock 1829, p. 5.

the Company had 1051 h.p. in use¹ and in 1861 the falls let totalled 1087 h.p.² In Greenock therefore considerable water power was in use, and fall No. 18, of 54 h.p. was let to Overton Paper mill.

On the other hand, not all contemporary opinion was in favour of water power. In the Agricultural Survey of Fife, Thomson, discussing the linen industry, which employed nearly 1000 hands, deplored the use of water power.³ It meant siting in remote parts, "with all the inconvenience of long carriages, bad roads, and scanty population". The steam engine, by contrast "obviated all these disadvantages and enabled the machinery to be placed in any populous town or village ... where hands can be got in plenty and at easier wages." Now the paper industry certainly employed fewer hands than did the linen industry, but it was not, on the whole, situated in such remote and isolated places. Moreover, the country parts, not the towns, were places of "easier wages". Even in the towns themselves there was frequently a suitable river. Notable towns with paper mills were Edinburgh, Glasgow, Aberdeen, Perth and Stirling with smaller ones such as Airdrie, Greenock, Linlithgow, Midcalder and Pennycuik. It would seem that long before the days of steam, towns had been established on or

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1. Post Office Greenock Directory 1853-1854. App. p. 13.
 2. Post Office Greenock Directory 1861-1862. All the concerns operating on the falls are listed and they included Foundries, Sugar, Paint, Rice, Cotton, Spinning, Dyewood, Sailcloth, Flour, Worsted and other mills as well as the paper mill.
 3. Thomson. Agricultural Survey of Fife. Edinburgh 1800, pp.307, 308. Also Fairbairn William Treatise on Mills and Millwork. 2nd Edition, London 1864 pp. 91-93, discussing the relative costs of water and steam shows that by then (1864) "in the improved state of the steam engine and the price of coal (7s. per ton) ... where a large amount of power is required, the chief source from which it must be derived is steam."

near rivers and sites for paper mills were found nearby. In general, the distribution pattern was not materially altered by the advent of the steam engine. Steam itself had long been used to heat the vats and to warm the drying lofts, both ideas contributing to an increase in output. The steam engine certainly contributed to the increased power needed to cope with expansion, but it was the paper making machine, and mainly water-driven at that, that changed the industry from unit sheet production to flow-line production. Our main consideration will therefore be of the paper making machine and not of the steam engine.

Paper making machines

The two machines which will be considered are that known as the Fourdrinier, invented by Nicholas Louis Robert in France in 1799 and Robert Cameron's "wooden man" invented in Scotland in 1816. Though this latter was a considerably later invention, and one which has not survived, as a native device it perhaps deserves prior consideration. Its principle was essentially primitive (it produced a succession of separate sheets and not continuous paper as did the Fourdrinier) though it was highly thought of by the writer in the Edinburgh Encyclopaedia,¹ who wrote "... Mr. Cameron's machine ... is a very good one ... an improvement on Cobb's of London ... It promises to succeed, though not in

1. Edinburgh Encyclopaedia Vol. XVI. p. 283.

competition with Fourdrinier for expedition or extent of work. It is better suited than Fourdrinier for small mills and may be important for laid paper". It was not, in the event, successful and no information on its installation, other than the presumed use at Springfield around 1816 has been found.

The Cameron machine¹ made use of the ordinary contemporary hand-made moulds. These were fixed into frames which were driven round an oblong horizontal track by means of a chain. As each passed a particular place, pulp, prepared in the ordinary way, and "mixed with water as required by the type of paper" was delivered on to the mould. The pulp which missed the mould or spilled over, was conveyed back to the cistern by an Archimedes' screw. As the moulds continued on their driven route, they were given a "shake" by means of a pin engaging with a wheel on whose circumference was cut a wavy groove. (It is clear that Robert Cameron was an able paper maker for he explained the double purpose of this shake" ... it removes water and makes it acquire correct texture ...") Continuing round, the moulds were tilted, the deckles removed, and the paper (or rather waterleaf) couched on to a revolving continuous belt of felt. As the empty moulds then passed back to the place where they

1. S.R.O. Chancery Specifications of Patents and Drawings. Box 16 (1816).

received the supply of pulp, they were washed by a stream of water. The pieces of paper on the felt were passed between two pressing rollers which were steam heated and this dried the sheets which were delivered from the machine on individual felt-covered boards. The most surprising item in the specification is the steam in the pressing rolls for drying, since drying rolls as a specific addition to paper making machines were not patented till 1820¹ when Thomas Bonser Crompton invented them. His method of heating was by wood or charcoal fires inside the cylinders: steam heating waited till 1839 when Robert Ranson patented the idea.² It seems odd that Cameron's use of steam was neither widely recognised nor widely used. It may be that his patent was only of Scottish importance for Gillis wrote³ that it seemed similar to Cobb's "chain of moulds" patented at the end of 1807⁴ (1808 in Scotland) and "which seems to have been in use at several Scots mills about this time". No confirmation of the use of Cobb's machine in Scotland has been found. Cameron's machine however shows the attempt to reproduce mechanically all the operations of the vatman and coucher. In this it introduced no new principle, but its drying arrangement was of great significance and it is surprising that it went unnoticed and unsung.

1. English patent No. 4509. 1st November 1820.

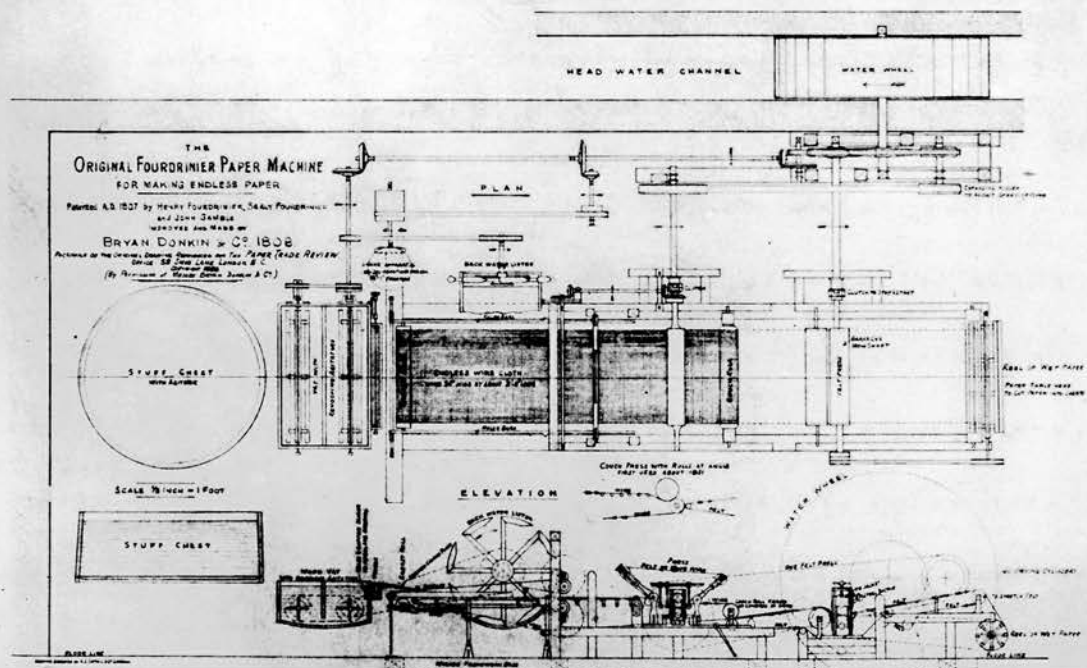
2. E. Patent No. 8310 December 1839 (R. G. Ranson & S. Millbourn).

3. Gillis W.P. T.R. 28 November 1913.

4. E. Patent No. 3084 December 1807.

Consideration of the Fourdrinier machine will show that its whole conception, while based on the well established chemistry or mechanics of paper making, made a distinct change in principle. Instead of individual pieces of paper, a continuous length was possible. The name Fourdrinier came from two London stationers, Henry and Sealy Fourdrinier, who financed its development in England. The original inventor was Nicholas Louis Robert who worked at the Essonnes mill of Francois Didot.¹ Robert gave the constant strife and quarrelling among the workers of the hand-made papermakers' guild as the spur that drove him to the creation of a machine to replace hand labour. He patented the device on the 18th January 1799 and paper was produced about 24 inches wide and in lengths of up to 15 yards. The paper was of course wet and had to be loft-dried in the manner of the day. The new principle involved was the use of an endless loop of woven wire cloth or sheet on to which the pulp was fed at a rate commensurate with the speed of motion of the wire. The wire was given a lateral "shake" movement and most of the water drained through the woven wire cloth. Just where the wire cloth ended its forward loop

1. For a full account of Robert's invention, his career and the subsequent history of the development of the machine, see Hunter D. Papermaking 1947, pp. 341-351 and 361-368. Also Coleman D. C. The British Paper Industry pp. 180-190. This gives much on the back-stage moves.



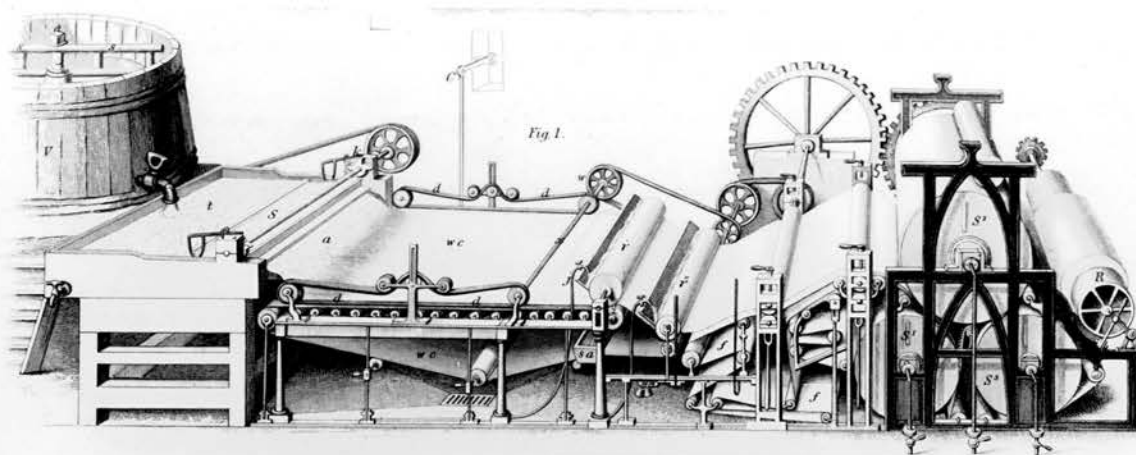
1807.

and went below to return to the beginning, the waterleaf passed under a felt-covered roller and thereafter could be removed from the machine for drying. The machine was hand-operated, slow, and small but it worked. Financial arrangements resulted in Didot's brother-in-law John Gamble's taking out an English patent in April 1801.¹ He also interested the Fourdrinier brothers, partners in Bloxam and Fourdrinier, wholesale stationers. Further patents were taken out² and an enormous amount of money spent on the development of the machine. John Hall of Dartford was involved as was Bryan Donkin who ultimately produced the "production" model; the Fourdriniers went bankrupt and much litigation and legal enquiry ensued. The machine however had "arrived". The first commercial English installation was in 1804 at Frogmore mill in Hertfordshire. The first Scottish installation had its licence dated 1st July 1807 and was producing paper from 1811. From then on the machine advanced through the Scottish industry at a considerable rate.

The main subsequent development was the incorporation of the continuous felt on to which the paper was couched or delivered from the wire and on which it passed over the drying cylinders. This meant the delivery at the "dry end" of paper ready for cutting and even for despatch.

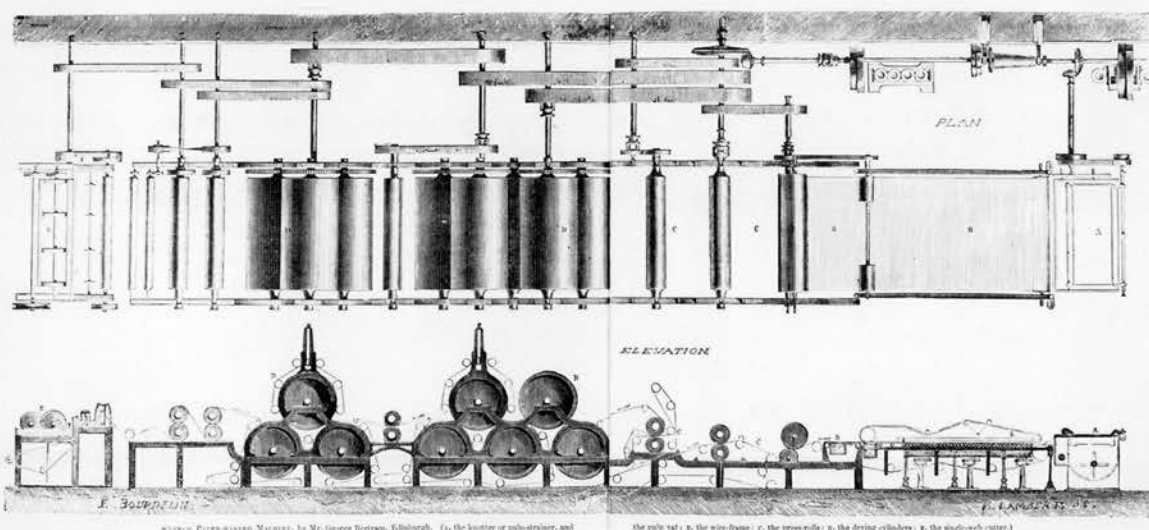
1. Patent No. 2487 April 1801.

2. Patents Nos. 2708 June 1803, 2951 July 1806, 3068 August 1807, 3568 June 1812, 4126 May 1817. A full description of the 1807 patent (with plates) is given in The Repertory of Arts, Manufactures and Agriculture, (2nd Series) Vol. XIII no. LXXVI September 1808 p. 217.



c.1850.

Cyclopædia of Useful Arts.



c.1862.

The Exhibited Machinery of 1862.

Tub sizing could still be carried out, but following the invention in 1805 of rosin size¹ which was mixed with the pulp, the whole process could be accomplished on the machine, continuous production was possible. Once it was possible to deliver dry paper at the end of the machine the output of the machines began to be increased. This was achieved by increasing their width and their speed. This latter change brought its own problems. Firstly there was less time for the water to drain through the wire. To overcome this difficulty the suction box was devised. One patent for this was granted to James Brown of Esk mill in 1836.² The device consisted of a box fitted close to the underside of the top wire and kept at reduced pressure. This resulted in a considerable withdrawal of water from the pulp into the partial vacuum in the box. A second difficulty resulting from the increased speed through the machine was that the time spent by the paper on contact with the drying cylinders was inadequate. To overcome this problem, more drying cylinders were added. Illustrations from about 1840, 1850 and 1860 show respectively 3, 5 and 8 drying cylinders. 3

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1. Renker A. Moritz Friedrich Illig. 1777-1845. The Papermaker Vol. 30 No. 2, 1960.
 2. Pat. No. 7098 May 1836.
 3. See illustrations.

In 1839 James Craig took out a patent on apparatus for boiling and washing rags.¹ Then as the sizes of paper-making machines increased the sizes of Hollander beaters increased, and Chas. Cowan took out a patent for improved beater and strainer operation.² The original hand-made era engines had rollers of two foot diameter and made of elm.³ By about 1845 the diameter had been raised to 2ft. 6 ins. and later, 3 ft. rollers were in use. Cast iron replaced the elm and this meant a considerably greater load on prime-mover, gearing and shafting.⁴ This great expansion in paper making engineering led inevitably to the establishment of specialist firms. In the earlier era the local wright and joiner were able to cope with most of the mill's requirements but the increasingly complex machinery could not be so handled.

One of the earliest engineers in the paper industry in England was John Hall (1764-1836) who founded his Dartford works in 1783. He is reported to have carried out work for paper mills at Duns and at Pennycuik.⁵ He also installed bleaching apparatus for Pitcairn at Melville Mill,

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1. S.R.O. Chancery Register of Specifications f.274, 1840.
 2. S.R.O. Chancery Register of Specifications 1846 No. 111.
 3. Edinburgh Encyclopaedia Vol. XVI p.280 and Esk Mills Documents, Letter Book.
 4. History of Bertram's ... system ... rag pulping engines. October 1875.
 5. Hesketh E. J. & E. Hall Ltd., Glasgow 1935.

Lasswade, in May 1794.¹ In April 1805 and intermittently till September 1807 there was correspondence between Esk Mill and John Hall who supplied a number of vat- and dry-presses.² When John Gamble and the Fourdrinier brothers made their first experiments with Robert's papermaking machine, it was to John Hall that they went. Subsequent developments were carried out by Bryan Donkin (1768-1855) who was apprenticed to Hall in 1792.³ It is not surprising that two other Hall apprentices should have turned their energies to paper machine engineering.

George and William Bertram, after working with their father at Springfield Mill, Polton, were apprenticed to John Hall at Dartford. In 1821 they returned to Edinburgh. William started an engineering works while his brother became a paper maker at one of the mills on the Esk. He soon joined William in manufacturing paper making machines and the St. Catherine's works in the Sciennes, Edinburgh, came into being. In 1845 their younger brother James started his own paper engineering firm in Edinburgh and both establishments are still eminent in the whole field of paper making machinery.⁴ By 1861 the St. Catherine's and Leith Walk

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1. Old Session Papers Vol. 207.3.
 2. Esk Mills Documents, Letter Book 23 April, 22 July, 22 August, 3 September, 1805 and 1 February, 26 April, 18 June 1806, and 3 September 1807.
 3. Coleman D. C. British Paper Industry p. 181.
 4. Within a mile of Edinburgh Town (History of Bertrams Ltd.) pp.3-6 and App. p.36 and Bertram's design books give details of machinery and customers from 1842-1844 and 1856-1866. Also James Bertram's papers include information on their completed orders from 1845.

works had made machinery for some twentyone Scottish mills but their "exports" extended into Hall's and Donkin's territory. Machines and machinery were supplied to at least a dozen English paper mills.¹

Further afield Dublin, Cork, New York and three places in Russia show the world-wide importance of the firms. Their range of machinery too, covered every aspect of papermaking, including water wheels and steam engines, and it seems fair to say that these two firms grew up and made a major contribution not only to the paper industry in Scotland, but to the industry as a whole. This they did as a result of the introduction of the machine and the mechanisation of that industry.

On the papermaking machine itself, the most important - and vulnerable - item was the continuous woven wire. Moulds for hand-made paper had been produced for over 200 years so that the weaving or laying of relatively small areas of wire cloth was well established. What was difficult was the making of the seam in an "endless" web in such a way that it would not make a large and visible mark on the continuous "web of paper" every time the seam came round. It may well have been difficulty with this join that caused Robert's first machine-made paper to be in two long separate sheets - possibly of the length of the whole

1. English mills supplied included Bingley, Bow, Carlisle, Cheadle, Clitheroe, Hale, Norwich, Roughway (Kent), St. Mary Cray, Shotley Bridge, Wandsworth and Wookey.

wire, once round. A further difficulty was to ensure a reasonable life for the wire as it was in constant flexure. Increasing speeds intensified this problem. The life of a wire was normally about 3 weeks, extending under favourable circumstances to about double that period.¹ Clearly it was important not to shorten this life, even with increased speed, as valuable production-time was lost in the changing. To supply these needs a Scottish firm was established about 1837 and it has since attained world eminence in its field.² According to the published account of the company,³ the originator of the enterprise was William McMurray who in 1825 set up as a wire-worker in the Trongate (Glasgow). His wares then had, as far is known, no connection with papermaking. No moulds have been traced to his hand, though they were certainly in use in the West at that time and for many years after. He moved to Edinburgh, setting up with his brother James as wire-cloth workers at Stead's Place, Leith Walk. William McMurray stayed a partner till 1872 when he sold out to his nephew, the young John McFarlane. It seems however that the McMurrays, and in particular William, had strong interests in paper and machine papermaking.

1. Spicer A. D. The Paper Trade p. 63.

2. The United Wire Works, Granton.

3. The History of the United Wire Works, Edinburgh 1947 (?).

In 1835 he became a partner with Russell at Kinleith Mill, Currie, where a machine had been installed in 1831. The partnership lasted till 1841¹ in which year he took out a patent for a syphon strainer for a paper engine (Hollander).² Between 1837 and 1846 McMurray and Durham carried on a wholesale stationery business at 9, Blair Street.³ William subsequently became the owner of the Royal paper mills at Wandsworth,⁴ of that at Esher (Surrey)⁵ and of estates for the production of Esparto in Spain and North Africa. James McMurray his brother and partner in the wire-cloth venture became a partner in John Cameron & Co. at Springfield Mill, Polton, in 1850.⁶ This mill had its third machine installed in 1843. These two men therefore had strong connections with paper and papermaking and in particular with the machines and strainers which needed wire cloth. The business of wire cloth weaving developed apace and to-day the firm is the largest of its kind in Europe.⁷ As well as supplying all the needs of

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1. Edinburgh Directories - though the Franks Report (PP.1843 XV) gives the occupant of Kinleith as McMurray & Co.
 2. S.R.O. Chancery Specifications, box 118. Patent 3rd February, 1841.
 3. Edinburgh Directories.
 4. Gillis W.P.T.R. 6 September, 1912.
 5. Listed in Thornton & Collie's list of paper mills, Edinburgh 1852.
 6. Gillis W.P.T.R. 6 September, 1912.
 7. The History of the United Wire Works. Edinburgh 1947, p.30.

the Bertrams, it has as customers most of the other paper machine manufacturers. This is a further example of a large and important business enterprise which arose in the Scottish industry as a direct result of the introduction of the machine in papermaking.

The Reasons for the Introduction of the Machine.

Nicolas Louis Robert is reported as giving as his reason for labouring to invent the paper machine, the constant strife and quarrelling among the workers of the handmade papermakers' guild.¹ Similar difficulty seems to have been experienced in England but it is doubtful if there was as much combination in Scotland. The purpose of the workmen's combination was to achieve an increase in wages and during the war with France it is likely that all wage-earners would feel the need for increases. In a Statement by the Fourdrinier brothers as patentees (and developers of the original Robert machine) issued in 1806, it was said that "... the manufacturer ... is relieved from the difficulties and loss consequent upon perpetual combinations for the increase of wages ..." A footnote to this sentence said "It is a fact that the mills have been kept unemployed for ten months at a time by these combinations which generally occur every two or three years, ..." ² In a report in a private notebook,

1. Hunter D. Papermaking p. 341.

2. P.P. 1837 Vol. XX Report from Select Committee on Fourdrinier's patent. Appendix A.p.44.

William Bertram, son of the co-founder of the firm, makes reference to strikes, though not to combinations, of workmen.¹ He wrote "In the year 1821 when my grandfather George Bertram ... was manager ... at Springfield Paper Mills ... a continual source of annoyance and interruption ... was the stopping of work or striking of the Vat men ...". Now this was written in 1889 or 1890 and was not first-hand information, and also some of the other "recounted" material is certainly not accurate.² Nevertheless this is a report of strikes at Polton in the Lasswade parish. No reports of such strikes occur in the Old or New Statistical Accounts of the parish and it is probable that their frequency, (a continual source ... of interruption) was an overstatement of the case. No evidence of any such frequent occurrences appears in the Cowan wage books from 1803. In the correspondence from Esk Mill from June 1804 till

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1. Bertrams Ltd. private paper reprinted as Appendix to "Within a mile of Edinburgh town", the history of Bertrams Ltd., p.36.
 2. e.g. The date 1821 is given for the erection of one of Robert Cameron's machines at Springfield and "... soon after this ... a patent ... in France by one "Robert" a workman in an engineers establishment, sometime before and taken up by his master "Didot" then "Fourdrinier" then by him to "Donkin" came to the Front and in 1827 or thereby their machine was first introduced to Scotland." The date for the Fourdrinier machine is much too late and even by 1825 Gillis reported 13 machines in Scotland (W.P.T.R. 18 April 1913) of which nine have been accounted for and by 1827 a further four or five have been traced.

December 1808 there is mention of only two stoppages. These concerned flood damage in September 1807 and an accident to the water wheel in December of the same year. This, perhaps negative, evidence nevertheless covers six mills for differing periods. Cowans were working Valleyfield, Lasswade, Bank and Low in the Pennycuik area and Kate's mill at Colinton: Esk was a separate enterprise.

As a result of strong representations, mainly by English paper-makers, an Act was passed "... to prevent unlawful combinations of workmen employed in the paper manufacturing.¹ The matter is fully dealt with by Coleman² and it is noticeable that most of the information concerns England. There is however a reference to "a confederacy of workmen employed at six of the principal manufactories in the neighbourhood (of Edinburgh) for increase of wages."³ At this time there were at least fifteen mills in the district, so that "six of the principal manufactories" would have been the major portion, but further information is lacking. Another reference to combination in Scotland occurs in the Rev. John Dempster's article on Denny parish in the New Statistical Account (1841).⁴

1. 36 Geo. III c. III 1796.

2. Coleman D. C. The British Paper Industry Ch. X and particularly pp. 261-276.

3. Ibid p. 262 note 6 (Balston MSS). This refers to a letter in 1792 from Whatman's brother-in-law R. E. Phillips, who was living in Edinburgh. R. Philip, occasionally spelt Phillips occurs in Edinburgh directories up to 1812 as "Commissioner of Customs."

4. N.S.A. Vol. VIII. Stirlingshire p. 129.

After a full description of the Herbertshire mill and its new machine, he said "... Combinations among operative papermakers were at that time [in the hand-made days] a frequent cause of great annoyance to masters and of misery to many innocent families. The improvements mentioned [paper machine] have put an end to combinations among paper workers." The question of costs will be considered presently but the reason for the machine putting an end to combinations is given in the Fourdrinier document already quoted.¹ The manufacturer, it was said, did not require workmen regularly educated to the trade, the most uninstructed person being competent for the purpose ... " This is a considerable overstatement of the case, but certainly workmen of reasonable intelligence could be machine operators without a long apprenticeship.

M. R. Kennedy was making paper at Auchterarder, Bridge of Allan and Crook of Devon from 1812 till the second half of the century. He went to work for John Luke at Crook of Devon in 1827 and was there till 1841. While there "... two men came from England with a petition against the machine ..."² It seems reasonable to infer that because the men came

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1. P.P. 1837 Vol. XX. Report from Select Committee on Fourdrinier's patent. App.A. p.44.
 2. Kennedy M. R. Reminiscences of a paper maker in the early nineteenth century. American Paper Trade Journal, 1885.

from England and he makes no other mention of such a thing, there was no Scottish petition at least in his area. This, in its turn, points to the absence of a strong combination.

Finally on this point there is a report from Berwickshire. Robert Kerr, who had lived at Ayton since 1795, wrote (after a section on the paper mills at Broomhouse, Ayton and Allanbank) "Almost every Scots journeyman paper maker is a member of a very flourishing benefit society long established in the neighbourhood of Edinburgh by means of which they are supported at their own joint expense when disabled by old age, sickness or accident and from that fund their widows have a regulated allowance and the funerals of members and their wives and widows are defrayed or very materially assisted".¹ Reference to such a society is made by the Rev. John Paton in his account of the parish of Lasswade in the Old Statistical Account.² These two mentions of the widespread membership of a benevolent society for papermakers do not rule out the possibility of combinations but they may be taken as balancing the report from Denny. Taken with the wages and correspondence books and Kennedy's evidence they lead to the conclusion that combinations were not widespread nor extensively active in Scotland, and that the masters were not held in

1. Kerr R. General view of the Agriculture of the County of Berwick. Edinburgh 1809 p.455.

2. O.S.A. Vol. X p.283.

the thrall indicated in England or France. If this is accepted, then it does not seem that the elimination of combinations was a major reason for the adoption, and the widespread adoption at that, of the machine by Scottish papermakers.

When the Fourdrinier brothers first announced their "new mode of making paper by machinery" they held out to potential customers several advantages. Some of these indicated the likelihood of increased profit to the manufacturer.¹ Firstly it was stated that the cost of hand-made paper was 16/- per cwt. whereas their machine could make the same quantity for 3/9d. No detail was given of the derivation for this great difference which would seem to be based purely on estimated labour costs. In more general terms, it was argued that a widespread introduction of the machine must produce a "considerable additional profit to the manufacturer". To reinforce this statement figures were adduced based on a seven-vat (hand-made) mill and on the comparative costs of operating a machine whose output would be the equivalent of that from 7 vats. The numbers of workers required were respectively given as 41 and 9 and the gross annual saving, mainly in labour cost, was set down

1. P. P. 1837 XX Select Committee on Fourdrinier patent. App. A. pp. 43-45.

as £1870.¹ These figures were intended simply to show the relative costs of operating vats or machine and did not include capital cost or the other necessary processes such as beating, sorting or the supply of rags. When dealing with the royalties payable and the first cost of the machine, figures were quoted for a "two-vat" machine whose operator would have to pay a royalty of £150 p.a. and "leaving a clear profit to the manufacturer of £412:17s." and a proportionately greater profit for larger installations. In the Fourdrinier brothers' first statement² of 1806, already quoted, the "price" of the machine was £1250 plus an annual royalty payment which varied from £150 to £500 according to the output of the machine. In their second statement the initial payment was reduced to £750 for the smallest (3 or 4 vat) size rising to £1040 for the largest (12 vat).³ The annual payments, or royalties, were

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1. It was laid down that the paper was "sized in the engine" (i.e. Rosin size would be added to the pulp) and moulds and wire felting and its washing and fire (doubtfully omitted from the machine estimate) were included as well as the labour costs. No raw materials or capital cost were taken into account however. The "raw" figures were £2604 for the 7 vat mill and £734 for the mill with a machine of 7 vat capacity.
 2. Ibid. App. A, p. 45.
 3. Ibid. App. B. pp. 47, 48. The figures quoted were for machines "driven by wheels"; if "driven by straps", the cost ranged from £715 to £995.

also reduced, ranging from £200 for the "3 vat" machine to £380 for a 5 vat machine and thereafter in steps of £80 per vat.¹ Now it has already been noted that the mere installation of a machine did not by itself convert a small mill to a large one. Physically, the machine was fairly large, a new Hollander beater might be required to supply adequate pulp and with an increased output, the rag storage and preparation as well as drying facilities would need to be increased. This would mean extensions to buildings and an estimate should be made of their cost. If this capital is charged at say 7% (which agrees with contemporary charges at Balbirnie) a truer annual outgoing can be assessed. Even when this is done it seems likely that the load factor on the early machines was small, so that the economic efficiency and therefore the profitability of an installation was probably less than the Fourdriniers indicated in their statements. However when a further increase in output was needed, the machine could be run more continuously and for longer periods - even up to 24 hours per day. The subsequent addition of drying cylinders made a major contribution to the efficient operation of the machine. Only when full advantage was taken of its potential could its full profitability be realised. In short, with the installation of a machine,

1. The development of the machine is indicated by the difference in range of sizes in the two statements. In the first, it was from "2 vats" to "5 vats" when quoting royalties and a "7 vat" size was used for cost comparison. In the second statement, the smallest size was "3 or 4 vats" and the largest "12 vats".

an operator automatically raised his output potential at the vat end to a size as great as that of almost any existing vat mill.¹ If his production was limited due to rag beaters, water supply for power or process, or any other reason, he was almost certainly paying too much for his restricted increase in actual output. He might have achieved as much by adding another hand vat or two. If he was to reap the full benefit of the machine then he had to have the rest of his mill geared to the output of which his machine was capable. A brief review of the published Fourdrinier figures with the addition of certain capital and royalty expenditure shows it still to have been a profitable investment.

Taking the lower (second statement) rates, the purchase cost of a "seven vat" machine was £895; the extras which would probably be necessary were a beater, a boiler to increase the drying and pulp heating facilities, drying rope and heating pipes together with an extension to existing buildings. These are shown below, costs being based on those quoted in Chapter Two above.

1. An 8 vat mill was considered a very large affair in the hand-made period. Sir William Forbes writing of the Polton Paper mill Company which failed in 1772 or 3 said "...they erected a very extensive paper mill consisting of 5 vats ... at a great expense ..." (Memoirs of a Banking House, Edinburgh 1859). In 1802 Broomhouse had 8 vats (S. F. I. P. No. 737137 29th September 1802). Although Cowans operated more than one mill, Valleyfield, the largest in that district had 6 vats.

Capital costs

Machine of 7 vat capacity	£ 895
Beater (locally made)	55
Boiler	40
Hair drying rope	40
Heating pipes	10
Building extensions	250
	<hr/>
	£1,290

	<u>p. annum</u>	<u>p. month</u>
Interest on capital at 7%	£ 90	£ 7:10:-.
Royalty on machine	540	45: -:-.
Cost of running machine (Fourdrinier)		31: 4:-.
Rest of mill operating costs including rag works		78: -:-.
		<hr/>
		£161:14:-.

Fourdrinier's estimate of £170 for the vats of a 7 vat hand mill was too high when compared with Cowan's wages book.¹ A realistic^{total} figure from these books is £187 to £190, so that the saving by using a machine over

1. From Cowan's wages books (1809) the average monthly wages bill for Valleyfield, a 6 vat mill, was £152. If this is scaled up to 7 vats, the amount is £176 and £190 is a reasonable figure to include certain extras, cartage, etc., for a 7 vat mill. Comparison of the wages of the full team of vatmen, couchers, layers, parters, etc., for 7 vats was less than £100 at Cowan's rates compared with the Fourdrinier figure of £170 per month. The cost of the rag women, engine men, etc., from the books was used to derive the figure £78 used for "Rest of mill operating costs."

the hand vats would be of the order of £30 per month. This was quite a saving and in the event many paper makers found it a worthwhile investment, especially when the royalty payments ceased. It is also interesting to note that the figure of £31: 4: -. given by the Fourdriniers as the cost of operating the machine, though slightly low and so in their favour, is of the right order. Messrs. Cowans, when their first machine was installed, costed it separately for the first two months. The figure was £33:10:11 for a month. Though the wages of the machine man rose soon afterwards from £3:2:-. to £3:12:-. per month, the figure is still in fairly substantial agreement with that given by the Fourdriniers. But it should again be stressed that unless the machine was working to capacity, the profits would be less, as was the case of Mugiemoss discussed below.

The position changed radically in the paper makers' favour however, when, on the bankruptcy of Henry and Sealy Fourdrinier in 1810, royalties ceased to be paid. Then, too, with the later introduction of drying cylinders the extra facilities and labour for air drying would be reduced. Though perhaps more rag preparation would be necessary, drying loft space would become available for other purposes. Figures are available for a somewhat later period (1841-1845) when these changes had taken place. Kate's mill, Colinton, had one machine. Its size is not known, but judging from its output it must have been one of the later larger units.

The operating cost, which included rag cutting and preparation was £80:7:10 per week and the output (averaged over a ten week period) was 8,831 lb. mainly fine demy, royal, foolscap, etc., and news. This output on the vat basis was equivalent to about 8 or 9 vats.¹ Over the period considered, the ratio of fines to news in the output was 26:1 and with contemporary prices of these at 1/- and 8 $\frac{1}{2}$ d. per lb. respectively² this represented a return of some £400 per week. Duty was payable at 1 $\frac{1}{2}$ d. per lb. which would come to about £56.

If the conversion from rag to paper be taken as 70% and the rag prices for the fine sorts as 25/- per cwt. and 10/6. per cwt. for the news, the outgoings on rags would total about £120.³ The rental of the mill may be taken to have been about £150 p.a.⁴ Then other typical outgoings were on 30 tons of coals, 7 cwt. of alum and 165 lb. of bleach powder as

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1. Although this method of assessment of size was common in the early years of the century when of course the hand vat was universal, it soon fell into disuse and sizes were given in terms of the width of the wire. None of the machines occurring in Bertrams' design books or in James Bertram's records uses the vat designation - all are in width of wire.
 2. Nat. Lib. M.S. 6290 f.219-246 letters to Alex. Cowan Pennycuik from their London agent quoting prices February - October 1838.
 3. It is possible that the conversion for news paper might be a little higher than 70% and for the fine sorts, slightly less, but for the purposes of the estimate the same figure has been used for both.
 4. In 1783 the rental of Kate's mill was £13 p.a. plus one ream of fine writing paper but in 1799 Admiral John Inglis bought the mill from Sir James Foulis for £3000. Taking as a basis the Scottish "20 year purchase" the rental may be assumed to have been £150 p.a.

well as white alkali, soda crystals, pearl ash, smaltz and oils. This may be put down at £50 p.w.¹ so that with no interest on capital, or depreciation fund, the total outgoings were c. £309 p.w. leaving a raw surplus of £91 per week - a high figure, which if accurate shows an excellent return on the machine. This mill however was also equipped with a steam engine so the amount put aside for depreciation and repairs might have been a further £15 p.w.² and with selling-discount at 7%, a surplus of some £53 per week remained.

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1. The mean quantities per week were Pearl Ash 2 cwt., Soda Crystals 2 $\frac{1}{2}$ cwt., White Alkali 5 cwt., Alum 7 cwt., Bleach powder 155 cwt., Smaltz 50 lb., Coals 30 tons. Prices taken from Macniven & Cameron's Paper Trade Review, Session papers 1866 Case 55 were, Pearl Ash 30/-., Alum 7/-., Bleach powder 11/-., all per cwt., Smaltz 1/4 per lb., Coals 10/- per ton.
 2. The machine would cost c. £800, steam engine £1000, plus boilers, pumps, etc.

Kate's Mill, Colinton

Computed Weekly Account c.1843

Receipts

Payments

	Wages (from book)	£ 80: 7:10
	Excise (1 ¹ / ₂ d. per lb. + 5% on 8831 lb.)	57:18:10
	Rags 9113 lb. at 25/- per cwt.) 3505 lb. at 10/6. per cwt.)	118: 2:11
	Rent at £150 p. a. say	3: -: -.
	Coals and chemicals say	50: -: -.
	Interest on capital (7% on £4500)	6: 1: -.
	Depreciation (10%)	8:13: -.
	Total Outgoings	£324: 3: 7.
2453 lb. News at 8 ¹ / ₂ ./lb.)	7% discount on sales	28: 8: -.
6378 lb. Fine Demy etc. at 1/- per lb.)	"Profit"	53: 3: 7.
	<u>£405:15: 2</u>	<u>£405:15: 2.</u>

- NOTE:
- (1) In the above, the rag conversion, rag prices, coals, etc., and capital are estimated values.
 - (2) If the date for this had been between 1821 and 1836 the duty on the Fine demy at least would have been 3d. per lb., making the duty payment some £96:6:7 with the "profit" reduced to £14:15:10. This is noted because of the Balbirnie figures below.

A profit considerably less than this was looked for by Wm. Ballingall, the factor of the Balbirnie estate when writing to his principal, General Balfour, in April 1833.¹ This two-vat mill made "Cartridge and Grey" papers.²

1. Balfour of Balbirnie papers. Letter from Sweetbank 30 April 1833.

2. So listed in the D & B and R. W. list of 1832 for Balbirnie (Excise No. 14).

He assessed the "profit" of the hand-made mill then at Balbirnie (with a reduced rental) to be 3d. per day. With a machine the output would rise by seven times and after raw materials, wages, rent and the excise were all paid would leave a balance "to pay the interest and living on" of £3:18:-. per day, or a little over £23 per week on an output of some 2240 lb. of paper.¹ In this instance the factor was trying to persuade the landlord to equip the mill with a machine and though he would not be getting a direct profit from it, it was held to be an improvement necessary to the survival of the mill. Other mill rentals on the estate were compared and in the event a machine was put in the next year (1834) and the mill is still in operation.

For comparison with these two mills some figures for a two-machine installation will be given and an attempt made to assess the profit potential of the machine in comparison with the Fourdriniers' claims. Full costs for the two-machine mill at Mugiemoss are available for the seven months January - July 1858.² The figures are of interest as the mill at the time was not doing well and the costing was made to determine the cause. The figures below have all been brought to a "per week" basis for comparison with the other two examples.

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1. The estimated output was 70 reams per day; taking Cartridge and Grey at about 32 lb. per ream gives 2240 lb.
 2. Davidson of Mugie moss papers. The original contains a full valuation of all buildings, machinery, stock, bad debts, loss on Government contract as well as Statement of Affairs, and Profit and Loss Account. The period of the account was January - July 1858.

Mugiemoss Mill, Aberdeen

Weekly Account calculated from 7 months figures

<u>Receipts.</u>		<u>Payments</u>	
Paper	£603:13: -.	Wages & Salaries	£ 54: -: -.
		Excise	228: -: -.
Misc.	5: -: -.	Materials	151:10: -.
		Coals & Chemicals	56: -: -.
		Interest	23: -: -.
		Repairs, felts	18: -: -.
		Freight	32: -: -.
		Discount on sales and	
		Charges in trade	46:10: -.
		"Profit"	9:13: -.
	<hr/>		<hr/>
	£608:13: -.		£608:13: -.

In the original statement attention was drawn to (a) the large debt to the bank (some £23,890), (b) the large sums paid for carriage. It is noticeable that the salaries and wages were low for a two machine mill. The third suggestion was "the diminished supply of paper produced by the machines when the water is low - the wages are still the same."¹ If it is assumed that the peak output for each machine was its capacity, then the load factor was 70% and with the output, materials, etc., sealed up a "profit" of approximately £40 emerges.

1. The output for the two machines is given for the twelve months September 1857 to August 1858.

These three installations show different operating patterns and without much fuller information can not be taken as accurate in detail. They show, however, that in the 1840's and late 50's when machines were in good supply in various sizes, paid no royalty and had drying cylinders and cutting apparatus, profits were to be expected with quite wide varieties of installation. Kate's was water- and steam-driven: Balbirnie and Mugiemoss relied solely on water. Kate's seems to have been a fully paid-up part of the Cowan concern whereas Mugiemoss was carrying a very large bank loan. Over all, however, with satisfactory water conditions it seems that a profit per machine of some £20-£30 per week could be expected. The high figure for Kate's may be due to the omission of some undisclosed expenditure such as carriage paid from Valleyfield and does not invalidate the general conclusion. The Fourdriniers in their second statement gave potential profits up to 5 vat machines¹ but a computed figure for 8 vats would be £1600 including a royalty payments. As this was not paid after the Fourdriniers' bankruptcy the postulated profit would be some £2500 or about £50 per week. If optimistic, it was of the right order and is in line with some of their other estimates which, perhaps naturally, favoured their machines a little heavily. The appeal could be, and was made to the owner and operator on the basis of profit and this seems to have been quite justified.

1. P.P. 1837 XX. Fourdrinier report App.B, pp. 47, 48.

There was another approach to profits - through increased turnover. Demand for paper had been rising since at least 1780. Newspapers accounted for a considerable increase in the consumption of paper. Numbers are a poor criterion since so many of the early newspapers consisted of but one folded sheet or less.¹ There were however about twice as many being published in 1840 as before 1780. In 1841 the number (in Scotland) was 68² and this was the period when size was on the increase. The reduction of the newspaper tax from 4d. to 1d. in 1836, its abolition in 1855 and the removal of the Advertisement tax in 1853 all helped the expansion and circulation of newspapers. Though they were not all long-lived, Cowan³ lists many new papers starting in the 30's, 40's and 50's: they amounted to about 40 between 1815 and 1832, 35 from 1833 to 1847, and about 20 more before 1860. In addition to the main centres, these were in such places as Banff (1845), Forres (1837), Nairn (1841 and 1853), Alloa (1841) Stranraer (1837 or 8), Kelso (1832), Campbeltown (1851), Ardrossan (1853). Thus with such widespread

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1. e.g., Dumfries Mercury, Edinburgh Gazette, Aberdeen Journal, Glasgow Courant.
 2. P.P. 1841 Sess. 2 II p. 52.
 3. Cowan R.M.W. The Newspaper in Scotland. He also says that in the 1840's four pages were rarely exceeded but by 1860 an 8 page make-up was common (p.278). On 3rd January 1849 the Aberdeen Journal expended to 4 sheets. See also pp. 133, 273 for the new papers.

burgeoning, the newspaper was a considerable market for the paper maker.

Book publishing too was on the increase not only in Glasgow and Edinburgh,¹ though naturally these were dominant. The Edinburgh Encyclopaedia (20 vols.) in 1830 and others, as well as the Waverley novels (25 vols.) may be instanced as "large" works. Figures for the drawback of the excise duty paid on paper used for printing Bibles and the Classics enable quantities to be computed. Between 1801 and 1814 the average annual drawback was £1870 for Bibles. Over this period the excise averaged 2.8d. per pound of paper produced so that the amount of paper used annually for these books alone was of the order of 71 tons or 8,000 reams. Between 1821 and 1830 the figure rose to an annual average of 90 tons or more than 10,000 reams.² Though small on the national scale, this indicates the increase in one small part of the book publishing trade.

There was great expansion in the Scottish textile industry and this called for quantities of pressing as well as wrapping paper for baling. The general increase and expansion of manufactures meant more paper for wrapping, for correspondence and for records. With the increase.

1. In Edinburgh, Balfour, Ballantyne, Cadell, Chambers, Constable.

2. S.R.O. Excise Accounts. Calculations made from average gross product and quantities received and drawback figures for Bibles.

of business activity there was inevitably an increase in litigation which meant more paper for the lawyers as well as published Court proceedings.

Population was increasing from 1801 to 1861 at the rate of nearly 25,000 per annum. By 1861 the population since 1798 had doubled.¹ The general economic development already mentioned was reflected in the increasing number of banks in operation. In the Bank of Scotland² are samples of bank-notes of over thirty banks operating in the first half of the nineteenth century and this is not the full count. It may then be said that there was throughout the first half of the nineteenth century, an increasing demand for paper and this was not confined to Scotland. Taking the same periods as above, the annual exports averaged just under 50 tons p.a. between 1801 and 1814. Between 1821 and 1830 the annual average was three times as much and still rising.³ (in 1831 the amount was nearly 270 tons). Looking at the state of output as a whole it was in 1783 that Scottish production first exceeded one million pounds (495 tons) with the number of mills in operation probably 26.⁴

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1. Kyd Sir J.D. Scottish Population Statistics, No. 1798, 1, 516, 492 1861 3, 062, 294.
 2. Bank of Scotland - at Head Office, Edinburgh, Minute and other books.
 3. S.R.O. Derived from Excise Accounts. The figures available give the amount (in cash) of the drawback on exports, again using the figure 2.8d. per lb. as the excise duty the amount of paper (and board) was calculated. (The figure 2.8d. per lb. was derived from the total production and total excise collected).
 4. The excise licences for mills were first issued in 1784 when the number was 27. Dalsholm and Kate's mill are dated as 1783 but the figure for 1783 is likely to have been 26, assuming one of them to have started early in the year.

By 1790 the total output had doubled and the number of mills had risen to 29. This output was itself doubled by 1817 and the number of mills at 57¹ was also about doubled. From this it is seen that in this hand-made era the increased output was obtained not so much by expanding existing mills as by increasing their number. This method continued till 1823 when the peak of 74 mills was reached. The machine, however, offered another solution to the problem. Though it is no doubt true as stated at the Fourdrinier enquiry that what was then (1835) being produced by machine and by hand could all have been produced by hand,² there would have been difficulties when the consumption rose still further - and in Scotland it exceeded four times the 1835 figure by 1860. Though, as indicated above, Scotland's water-power potential was considerable in this period it is unlikely that even with the aid of steam engines the ultimate output of 1860 could have been realised in vat mills. The early machine offered the output of seven vats³ and quite apart from the saving in labour force made possible the rapid production of large quantities of paper. As noted

1. S.R.O. Excise Accounts.

2. P.P. 1837 XX p.12. Answer to Question 168 by Mr. James Low "... if you had to make the same quantity by hand as is now made you would require a vast number of vats and larger premises to produce it; but the quantity could unquestionably have been produced by hand."

3. Ibid. p.9 Question 111 and App. A.p.42.

4. N.S.A. Vol. 1, p.44 1839 (Pennycuik) "... There are five paper machines (another is now being put up at Esk Mill) constantly employed for at least 12 hours per day and occasionally through the 24 ..."

above, even a 5 vat mill was considered large in the hand-made era so that by offering a machine the equivalent of 7 vats, a major change in scale was being offered to the 1 or 2 vat mill operator. As was emphasised when dealing with it, the Hollander beater was the key to large scale production: the machine could produce paper only so long as it was supplied with pulp. Nevertheless it could go on producing "endless paper" for 12 or even 24 hours per day¹ when it was suitably fed and it was this facility that appealed to the manufacturers. It enabled them to produce the quantities required and it gave them increased profits, due mainly to the large turnover, even with the reduction in prices which occurred.

Consideration must now be given to the machine's other effects upon the industry and firstly we will consider the pattern of installation in relation to its effect on siting and geographical distribution.

Exact information on the installation of machines is unfortunately sparse and well scattered. It is known that the licence to instal the first machine in Scotland was granted on 1st July, 1807. There were eleven licences granted on that day, only the Eynsham mill at Oxford ante-dated this: 20th May 1807.² It is extremely unlikely that the

1. N.S.A. Vol. 1, p.44 1839 (Pennycuik) "...There are five paper machines (another is now being put up at Esk Mill) constantly employed for at least 12 hours per day and occasionally through the 24 ..."

2. PP. 1837 Vol. XX. Report from Committee on Fourdrinier's patent p. 37.

production facilities at the Bermondsey works managed by Brian Donkin for Gamble and the Fourdriniers could have coped with anything like this number at once. In the original (1806) "Statement ... on ... making paper by machinery" the time to make a machine is given as 12 months.¹ The actual date of installation or successful production at Culter is given by Dr. Skene Keith as 1811;² the first use of machine-made paper by the Aberdeen Journal was on 26th August 1812.³ Only eight other installation dates have been noted up to 1825. These were Springfield (Cameron's) 1816, Stoneywood 1820 or 1822, Valleyfield 1821, Auchendinny and a second machine at Peterculter 1824, Dalmuir, Melville and Polton 1825. In this year (1825) the total for Scotland is reported to have been 13,⁴ so that we are left with four unaccounted for.

In the next seven years the total rose to 32 and a full list of these exists.⁵ In 1851 there was a government survey of mills but unfortunately

1. Ibid. App. A, p.46.

2. Skene Keith. Agricultural survey of Aberdeenshire 1811.

3. Fraser Geddes of the Culter mill examined the files of the Aberdeen Journal in c.1930 and noted that on 26th August, 1812 machine made paper was used for the first time. Quoted in the Deeside Field 1933 by A. A. Cormack.

4. Gillis W.P.T.R. 18 April 1913.

5. Paper Mills in Scotland, a sheet published by Oliver & Boyd, Edinburgh, and Robert Weir, Miller Street, Glasgow, April 1832.

this listed for each mill only the number of beating engines and did not mention machines.¹ It is likely that machines were in such general use by then that, if noted at all, their width and speed would also have to be recorded in order to give an idea of their output.²

From the information available at least 72 machines have been located, and as the number of mills licensed in 1860 was 52, this is a fairly complete list.³ Some of the 72 were silent in 1860 and some of the mills had more than one machine. It seems clear however that the machine had, by the end of the period under review, become essential to success in any "ordinary" paper mill.

As already pointed out in dealing with Finance, it was the more successful and forward-looking hand-made concerns which were able to finance the installation of paper making machines, helped in some cases by the landlord or a wholesale stationer, rag merchant or by another paper maker. Up to 1832 when the number of installed machines was 32,⁴ only about two mills had been started as specifically machine- or non-vat-mills. Overton mill (Excise No. 73) at Greenock had, according to

1. Accounts & Papers (Trade etc.) 1852.

2. From information from Bertrams Ltd., the speed of machines had increased by about 1862 from 33ft./min. to 120 ft./min. and the width from 30in. to 92in.

3. It is possible that about 6 other machines were installed in old or short-lived mills such as the second Loch mill at Linlithgow (Excise No. 30), Scott & Chalmers, & New Mill, West Calder (Excise No. 32), John Milne shown in the 1860 list.

4. The number 32 arises from the 30 in the Oliver & Boyd and Robert Weir list of 1832 plus the machines installed at Melville Mill in 1825 and Rothes in 1826 which were "silent" in 1832.

Spicer¹ a Fourdrinier installed in 1827. Now the motive power for this mill was water, derived from fall No. 18 on the first line of the Shaws Water Company. This concern was constituted by Act of Parliament on 1st June 1825 so that it seems reasonable to take this as one of the first paper mills erected in order to use the machine. It may be that two machines were installed initially as there were two there by 1832. Another mill which may well have started up as a machine mill is Townhead (Excise No. 72) at Kilsyth. The first mention found of this mill is in the 1832 list where it is credited with one machine. Though the excise numbers cannot always be relied upon for mill dating it seems reasonable in this instance to attribute Townhead, No. 72, with a similar date to Cverton, No. 73, 1827 or 1826. Of the total of 32 machines installed by 1832 then, only three were installed in "new" mills so that up to this date the machine had substantially no effect on the location of the industry. This is perhaps less surprising when it is recalled that the effect of the machine was primarily to enable the processing of much larger quantities of pulp. It replaced the vat and had nothing to do with the motive power. Provided there was adequate water for processing and for driving the mill (beaters and machine) all the other factors, the availability of raw materials, of markets and adequate transport still obtained. Thus

1. Spicer A.D. The Paper Trade p.219.

those concerns which were well-sited and successful as hand-made mills found no necessity to move when a machine was installed. In the period from 1832 to 1861 some 44 machines were installed and 22 of these were in old-established hand-made mills. Thus out of the 76 or so located in the 50 years from the first Culter mill machine in 1811, 54 were in mills which were hand-made concerns, and so had no effect at all on the geographical distribution of the industry. Of the remainder, three have already been mentioned. These were Townhead Kilsyth in the Stirling area and Overton, with two machines in the Glasgow or western area. The next mill known to have been started as a machine mill was Chirnside Bridge in 1842 which got a second machine in 1851. Together with Ayton (Bleachfield) which also started in 1842 these three machines were installed in the long-established Berwickshire area. The Aberdeen, Fife, Pennycuik and Linlithgow areas each had one new machine mill started. These were respectively Inverurie 1858, Fettykill 1848, Dalmore 1843 (with a second machine in 1859), and Avon 1860.

By far the largest group of new mills was started in or on the fringe of the Glasgow area. Of these, there were nine. At Airdrie, there was Caldercruix in 1848 and at Bathgate the Westfield mill had two machines and possibly started in 1834.¹ The other seven were Bowling (1852),

1. This date is given by Spicer (The Paper Trade p.218) but the first mention of the mill is in the 1860 list of The Stationer. It does not figure in Thornton and Collie's list of 1852, nor in Bradshaw of 1853 nor in the manuscript alterations to a copy of that list in the office of The Papermaker, dated 1858.

$lb \times 10^6$
5

OUTPUT of GLASGOW AREA.

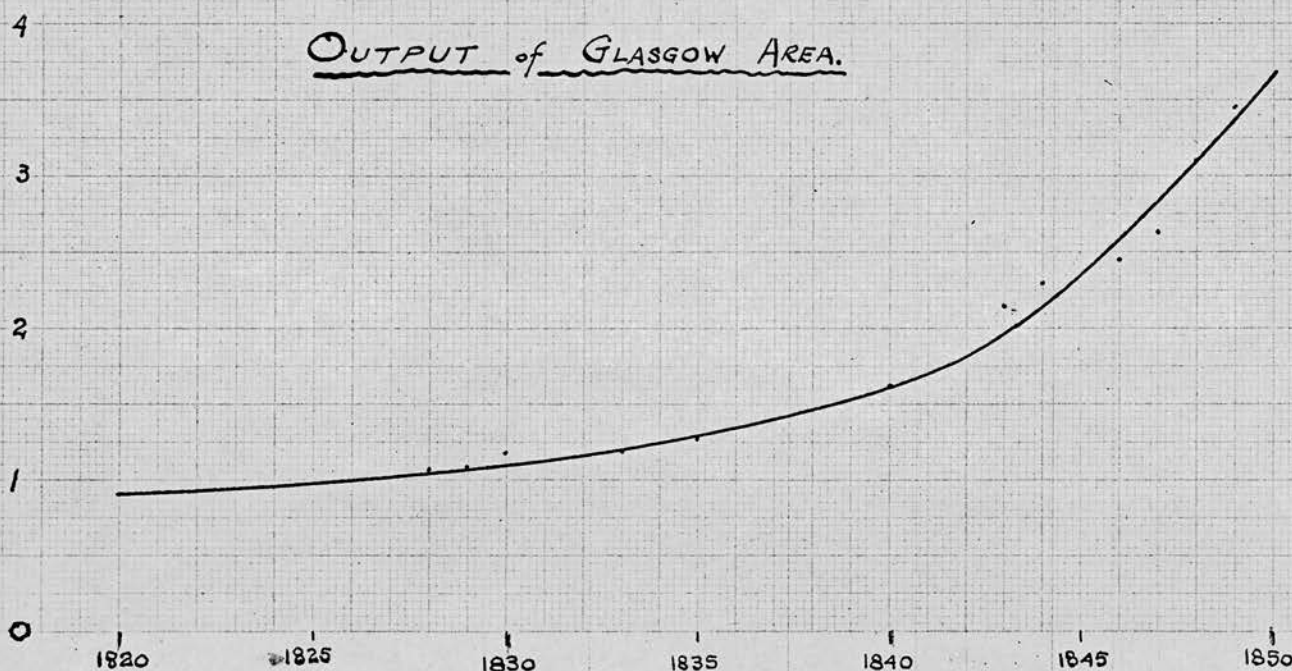


FIG. 1.

Clyde (1856), Hutchesentown, Govan (1832), Port Dundas (1850) and Woodside (1837), Govanhaugh (c.1860), Kelvindale (1845). The output and importance of the Glasgow area rose markedly. As discussed in the Geography chapter above, this area did not increase its percentage contribution to the Scottish total, but so rapid was the expansion of that total that even with its fairly static percentage, the Glasgow output was just on trebled between 1833 and 1849. (See fig. 1) Figures are not available for the area after this but about ten machines had been installed by 1848. After this date a further eight were started and even if some of the resulting 18 were "silent" in 1860 the output and importance of the area must have continued to rise. Moreover for the purpose of this discussion, the "Glasgow Area" has been taken to comprise somewhat more than the excise collection known as Glasgow - (e.g. Bathgate and Airdrie) so that the size and importance of the area are slightly undervalued by the use of the collection figures.

Some of the more remote mills were closed but all the areas which developed in the hand-made era survived till 1861. The 22 older mills which had machines installed between 1832 and 1861 have not been separately mentioned but are included in table 2 "Machines in paper mills". The only mills to break fresh ground were Brechin (1851) and Bullionfield (Dundee) (1850) both in Angus and paying their excise dues to the Montrose collection. The first of these mills does not seem to have survived for long but Bullionfield continued till January 1965. Thus it is seen that so wisely and suitably had the Scottish paper industry established itself that the coming of the machine had substantially

no effect on its geographical distribution.

Reference to the table and the totals given above shows that the rate of installation of machines was not constant throughout the period from 1811 to 1861. From 1811 to 1825 with 13, the rate was 1 machine per 13 months. From 1826 to 1832 there were 19: a rate just on three times as high, one machine per $4\frac{1}{2}$ months. In the last period, from 1833 to 1861, a total of 44^1 machines gives a rate of installation of one per 9 months. The initial rate of one in 13 months seems good for the initial or "proving" period. After this, when the machines had shown their worth they were installed at a much greater pace. During the final period the rate slowed somewhat but during this time there was a continuing increase in both the width and speed of the machines. This is clearly seen from a consideration of the change in output per mill during the whole period from 1784, when, of, course, all mills were vat or hand-made concerns.

1. These various totals do not correspond at all with those in Appendix VI in Spicer's The Paper Trade. His source is "various trade journals and information from Mr. Bryan Donkin": the figures for Scotland seem to be defective.

Machines in Paper Mills in Scotland

1811	Peterculter (Licence 1807)	
1816	Springfield (Cameron's m/c.)	
1820	Stoneywood (or 1822)	
1821	Valleyfield	
1824	Auchendinny, Peterculter (2nd m/c.)	<u>Total 13</u> (Gillis W. P. T. R. 18 Apr. 1913)
1825	Dalmuir, Melville, Polton	(4 unaccounted for)

1826	Ayton (Millbank) Rothes	
1827	Mugiemoss, Overton (2 m/cs.), Townhead	
1828	Dalmuir (2nd and 3rd m/cs.)	
1829	Stoneywood (2nd m/c.)	
1830	Auchmuty	Airthrey No. 3, Balerno 2 m/cs. Broomhouse,
1831	Esk, 2 m/cs., Kinleith, Low.	Dalbeattie, Kate's Newbattle,
1832	Valleyfield 2nd m/c.	St. Leonard's, Woodhall.
		<u>Total 32</u> (O & B R W's list) plus Rothes and Melville "silent" in 1832.

1834	Balbirnie	
1835	Polton 2nd m/c.	
1836	Waterton	
1837	Woodside	
1838	New Kilpatrick	
1839	Herbertshire, Mossy	
1840	Crook of Devon	
1841	Springfield 2nd m/c.	
1842	Ayton (Bleachfield), Chirnside Bridge	
1843	Dalmore, Loch, Polton 3rd m/c.	
1844	Mugiemoss 2nd m/c. Portobello	
1845	Kelvindale (m/c. from Airthrey 3 to Airthrey 2)	
1846	Bank	
1847	Caldercruix	
1850	Bullionfield, Moffat, Port Dundas	
1851	Brechin, Chirnside Bridge 2nd m/c. Newbattle 2nd m/c.	
1852	Bowling	
1854	Dalbeattie (2nd m/c. or replacement)	
1856	Kinleith 2nd m/c.	
1857	Clyde	
1858	Kevoek, Inverurie	
1859	Dalmore 2nd m/c. Mid Calder	
1860	Avon, Govanhaugh.	
		<u>Total c. 74</u> including Balerno Bank, Carrongrove, Cathcart, Millholm), Dalsholm, Hutchesentown, West (Colinton) (all undated).

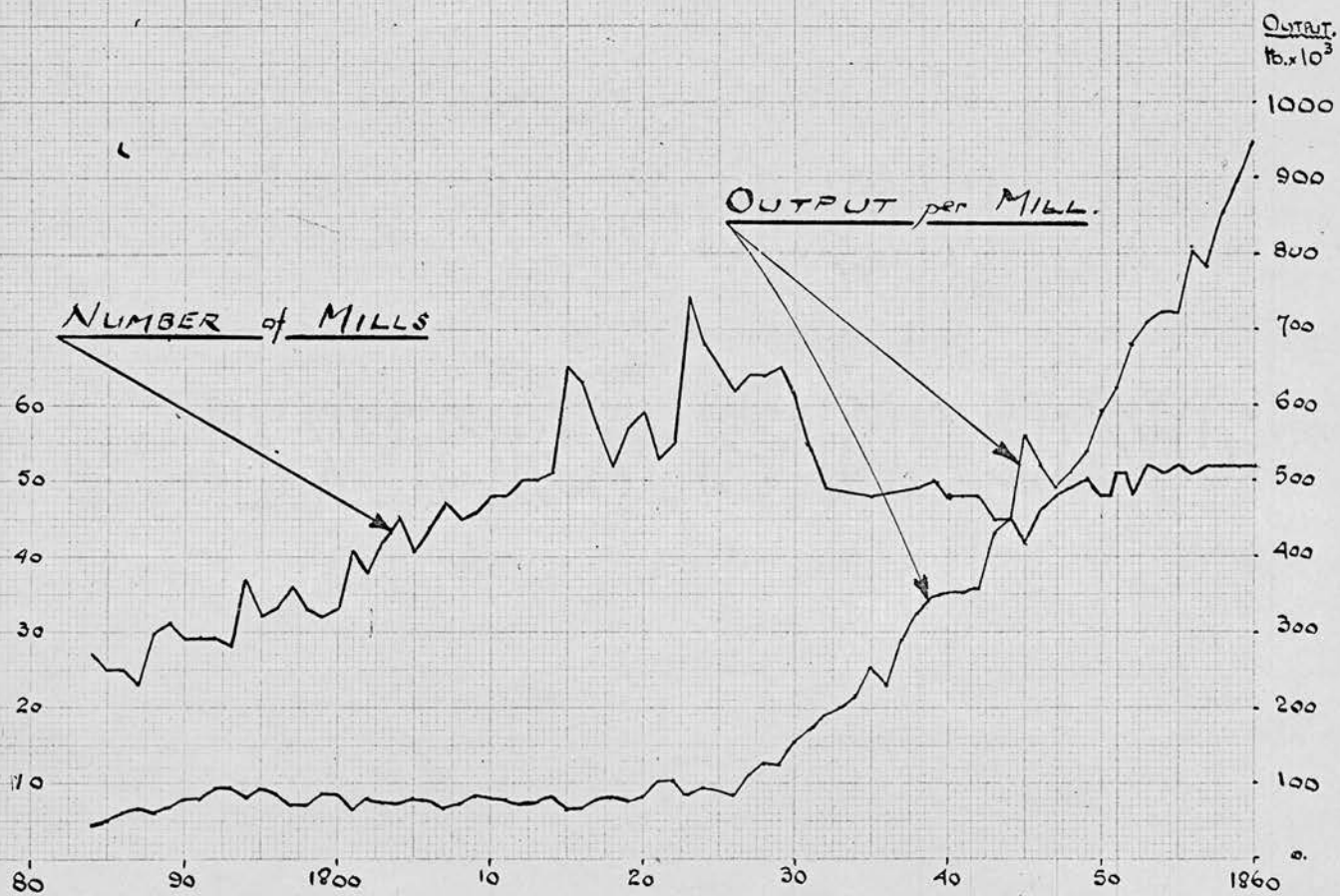


Fig. 2.

It was mentioned above that the number of mills operating in 1783 was probably 26 and from the excise figures available, figure 2 shows the number of mills licensed per year.¹ From this it can be seen that the increase in the number of Scottish paper mills from 1784 to 1825 was at the rate of about 1 mill per year. This is a net increase taking into account mill closures. From about 1825 to 1835 there was a considerable fall in the number of mills licensed. The rate of fall was approximately 5 mills per 3 years. From 1835 to 1860 there was an average net increase again of approximately 1 mill per 6 years. During the whole period 1784 to 1860 the national output rose at an average rate of 5% per annum.² Thus, as also shown in fig. 2 the output per mill per annum rose very considerably during the period. In the hand-made era, taken as up to 1825, there was a surprising constancy of the output per mill. The mean output per mill over this period was just on 78,000 lb. per annum. The increase in the national output was achieved at that time largely as a result of the increasing number of mills. Though there were large mills, the number of new small mills kept the average output per mill to the more or less constant figure noted and this

1. S.R.O. Excise Accounts.

2. Output in 1784, 1,222,032 lb. in 1860 49,069,040 lb. See also Excise.

YEAR	NUMBER OF MILL	EQUIV. VATS per MILL	TOTAL EQUIV. VATS.	HAND MILLS @ 2 VATS/MILL	HAND MILLS @ 3 VATS/MILL
1835	48	4	192	96	(64)
1860	52	14	728	(364)	243

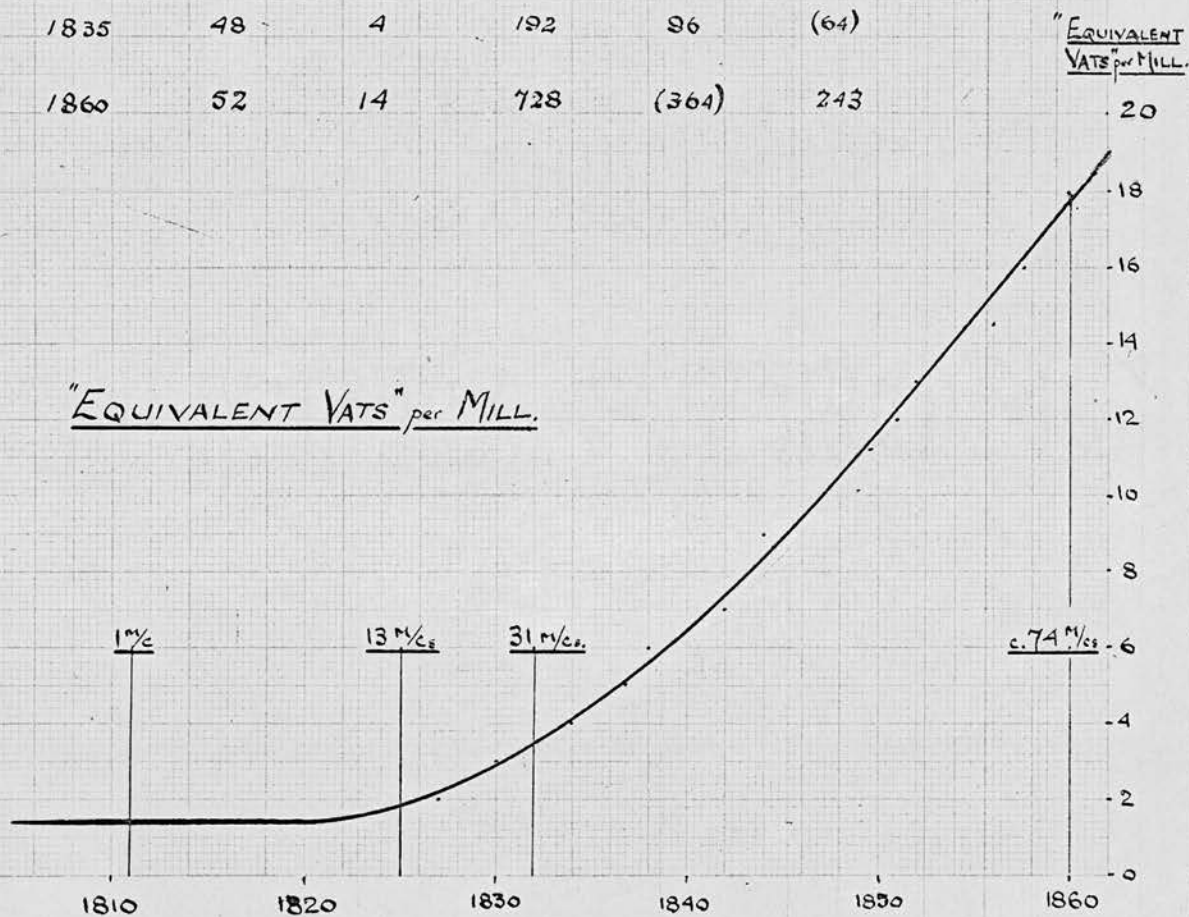


FIG. 3.

output represented a size of about 3 vats for every 2 mills.¹

Now as has been seen already, the paper making machines did the work of vats and in the early days the machines were rated or sized as being equivalent to a number of vats.² Though this was later abandoned in favour of wire width as a measure of size, the "equivalent vat" makes a convenient yard-stick with which to measure the increase in size or output of the mills. Taking the output of one vat as about 50,000 lb. per annum, a curve may be drawn showing the number of "equivalent vats" per mill. This is shown in fig. 3 and it reinforces the point made earlier that in 1835 the total Scottish output might well have been met by hand-made mills. In this year the "equivalent vats" were 192 so that with the average size of hand-made mill increased to two vats this would have meant 96 mills - a number which seems quite possible. By 1860 however the position was quite different. With an output equivalent to that from 728 vats even with the average size raised to 3 vats per mill, this would have meant nearly 250 hand-made mills, a highly improbable figure.

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1. Taking the figure given in the Fourdrinier enquiry (p.44 footnote 4) of 480 cwt. per vat per annum (53,760 lb.) an output of 77,738 lb. would be produced by 1.5 vats, thus 3 vats per 2 mills. This figure of 53,760 may be a little high, the Edinburgh Encyclopaedia (Vol. XVI p.280) gives the output of one vat as 6-8 reams per 10 hours. Taking the higher figure, a 6 day week and 20 lb. for a ream the result is just under 50,000 lb. which is in fair agreement.
 2. Hunter D. Papermaking p.507 "In the early days of the paper machine ... it was stated that a machine of thirty inches could supplant the work of four vats, a machine of forty inches could produce the paper ordinarily made at six vats, a forty-four inch machine could duplicate the production of eight vats and a fifty-four inch machine the output of twelve vats." The same equivalents are given in the Fourdrinier Committee report of 1837, p.47.

The increasing sizes and speeds of the machines meant that quite "small" i.e. one machine mills could have outputs far in excess of their equivalent ability as true vat mills. This partly accounts for the fact that despite the very large increase both in total output and in output per mill there did not arise a group of giant mills. Another reason was that although there were economies in scale, giant mills with 6 or 8 machines, would certainly have required steam power and the capital expenditure would have been too great.¹ There were seven concerns using more than one machine by 1832, but out of the total of 31 machines then operating in Scotland,² this does not indicate a great concentration of production in a small number of units. Certainly the number of mills fell from an all time peak of 74 in 1823 to 48 in 1835, but a substantial proportion of this number was what might be termed "small" one machine mills. Typical of these was Balbirnie where a one-vat mill produced the coarser sorts of paper in an earlier era. It may also be said that the effect of the machine on the size and structure of the industry was to increase the scale of operation of all surviving mills. Extremely large monopolistic units did not arise and a place remained for the smaller unit within the industry.

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1. This opinion is confirmed by the present operators at Cowans and Collins, two of the larger XIXth century concerns.
 2. Rothes, installed in 1826 was "silent" in 1832 and was bought by Robt. Tullis in 1836.

Before considering the effect of the machine on quality, its effect on workers and their wages will be briefly examined. There is little doubt that the drop in numbers of mills already noted after about 1826 caused unemployment among paper mill workers. This however was not as serious as it might have been in a more highly localised industry. The instance of M. R. Kennedy, mentioned above, who made paper at Auchterarder, Bridge of Allan and Crook of Devon was by no means an isolated one. There was considerable coming and going between the Esk and the Water of Leith - the case of Charles Aitchison being perhaps outstanding.¹ Thus the displaced workers would migrate to mills where machines had been installed. Much was made by the Fourdriniers brothers of the saving of labour by the installation of a machine and of the ease with which machine men could be trained. This saving was only of vatmen however and it was

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1. Session Papers 595 No. 55 p.196. "Deposition of Charles Aitchison, paper maker residing at Slateford ... I will be seventy-nine years of age in December next (1866). I was bred a paper-maker and served an apprenticeship of eight years with Mr. Pitcairn ... Melville Mill ... my apprenticeship began in 1797 and I continued... for about a year after my apprenticeship was out ... Some little time after leaving the mill... I was employed at Bank Mill near Pennycuik and soon afterwards I went to Valleyfield... but I did not remain long there but went to St. Leonard's Mill near Lasswade. I think I went there in 1808 and remained eleven years. I was then for a short time at work in East Lothian (Saltoun) after which I worked for some time as a labourer at Springfield... I returned to Melville Mill to work for Mr. Cowan, and on his leaving Melville Mill, to Mr. Naismith ... till his failure in 1822... and I returned to Saltoun for a short time and went to Esk Mill in 1824 and remained working as a paper maker for thirteen years ... After leaving Esk Mill I went to Dalmore Mills and was employed there for about three years and a half. After that I went to Colinton Mill for about eight months, and then I went to Kate's Mill ... to Mr. Cowan and remained there in his employment for twenty years. I have done no work since ..."

soon found that the machine men needed the judgment and experience of vatmen. As the machines were equivalent to a number of vats, then with say three men operating a machine capable of producing an output equivalent to that from 7 vats there would be a saving of 7 vatmen, 7 couchers, 7 layers. On the other hand such a machine would require the pulp for 7 vats and rag preparers for rags for that quantity of pulp was well as pressers, finishers and packers to cope with such an output. Thus it was that employment in one capacity or another would be available in the expanding industry.

Vat mills continued, though on a decreasing scale throughout the period of this study. Waterston gives the date for the last hand-made paper as 1873 at Cathcart (Millholm)¹ though it is not suggested that this was a purely hand-made mill at the time. Recent information suggests that Peggy's mill at Cramond may have outlasted Cathcart.² Cowan's various extensions covered at various times, some six or seven mills.³ Bank was the last to use the hand process and this was not finally superseded till after 1848 following the installation of a machine.⁴ Information on the

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1. Waterston B.O.E.C. Vol. XXV, p.51.
 2. Cadell papers "Valuation of Peggy's mill 1859" and Gillis (W.P.T.R. 1 May 1914) gives September 1881 as date when the mill passed to a chemical manufacturer.
 3. Valleyfield, Low, Bank, Lasswade, Melville, Kate's, Bullionfield.
 4. Gillis W.P.T.R. 12 July 1912 and information from Cowan papers.

cessation of the use of vats is much less specific than that on the installation of a machine. It is often a matter of conjecture when the vats were discontinued. It seems though that the Waterton mill ceased using vats shortly after a machine was installed by the operator Thos. Jaffray about 1836. The Davidsons of Mugiemoss were there by 1852 and as the mill originally had only one vat it is extremely unlikely that it continued in use alongside the 54 in. machine.¹ Peggy's mill at Cramond was still a two-vat mill in February 1859 when the whole was valued at £3867.² There is no information of a machine there and it is reported as being sold to a chemical firm in 1881. This mill then continued the hand-made tradition and may have been the last in Scotland. Midcalder seems to have carried on till 1859 or 1860 with the vat process.³ In 1845 John McNobie is reported to have moved his machine from Airthrey No. 3 (Excise No. 71) to Airthrey No. 2 (Excise No. 38). This latter mill continued throughout the rest of the period and was in operation in 1860 by Robert Philp. The other was closed at the time of the move (1845) and the original Airthrey No. 1 (Excise No. 40) had ceased work by 1832 so that in this group the hand-made method did not survive long after 1845.

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1. The C & B and R. W. list of 1832 lists Waterton, operated by Thos. Jaffray with one vat. Gillis (W. P. T. R. 18 April 1913) says new 40 ft. diam. water wheel was installed in 1836 and when William Davidson was there (in 1852) there was a 54 in. machine.
 2. Cadell papers.
 3. The 1832 list says "1 Vat" and Gillis (W. P. T. R. 8 Nov., 1912) gives a 58 in. machine "before 1861."

A machine was installed by Robert Craig at Portobello about 1844 and judging by the reports of the change in output and policy the vats must have been abandoned very shortly after this. It would seem then that the hand-made method, though still practised to a small extent was by way of being a survival rather than a vigorous specialist branch. In England William Balston and Barcham Green continued not only to make fine hand-made papers, but dominated the market. In Scotland no such specialist developed or survived.

In the vat mills, the highest paid workmen were the Vatmen and the Couchers. There was sometimes 6d. per week difference between them in the Vatman's favour. The rates in February 1806 at Cowans (Valleyfield Mill) were 15/- and 14/6 p.w.¹ This was a time of increase for there was a 1/- p.w. rise for both in March and another in April of the same year. These remained for three years after which they rose by 3/- p.w. to 20/- and 19/6 respectively. The layer was often a lad receiving 3/- p.w. in 1806 and 4/- in 1809. Parters were usually 6d. p.w. less than couchers, and dry-workers 2/- p.w. less than that. The pressmen were paid considerably less, getting 11/- p.w. in 1806. These rates were still current in 1818. In this period the machines were beginning to be introduced and machine men were

1. Cowan's wages books are the source for all the wages quoted.

	Dec.	March	April	April	Nov.	Feb.	Oct.	Aug.	Jan.	May	Aug.	Oct.	June	Jan.	Dec.
	1805	1806	1806	1809	1811	1822	1822	1825	1829	1836	1841	1843	1853	1856	1860
Vatman	15/-	16/-	17/-	20/-	15/-	17/-	17/-	17/-	18/-	16/-	16/-	18/-	-	-	-
Coucher	14/6	15/6	16/6	19/6	14/6	16/6	16/6	16/6	17/6	16/-	16/-	18/-	-	-	-
Laver	3/-	3/-	3/6	4/-	4/-	5/-	5/-	4/6	5/8	4/-	6/-	4/6	-	-	-
Casting felts	2/6	2/6	2/6	3/-	-	-	-	-	5/2	3/-	-	-	-	-	-
Loft (Dryworker)	14/-	15/-	16/-	17/-	14/-	15/6	15/6	13/-	11/-	13/-	14/-	16/-	-	-	-
Parting	3/-	4/-	3/6	3/-	3/-	3/6	3/-	3/-	-	3/6	3/6	2/6	-	-	-
Engineers	16/-	17/-	17/-	20/-	-	17/-	-	-	17/10	17/-	-	14/-	-	-	-
Bleaching	10/-	10/-	11/-	-	-	-	-	10/-	11/-	10/-	10/-	13/-	11/-	13/-	14/-
Machines	-	-	-	-	-	15/6	13/-	16/-	16/-	16/-	16/-	18/-	17/6	19/-	20/-
Sizers	-	-	-	-	-	-	-	-	15/-	15/-	15/-	17/-	16/6	15/-	17/6
Finishers	-	-	-	-	-	-	-	-	15/-	15/-	15/-	-	15/6	-	18/-
m/c Dryers	-	-	-	-	-	10/-	15/6	12/-	11/-	13/-	14/-	-	15/6	15/6	15/6
Beating Engines	-	-	-	-	-	-	10/-	-	-	14/-	16/-	16/-	17/6	17/6	19/-
Breaking in Engines	-	-	-	-	-	-	-	-	-	-	-	-	-	15/6	16/-
Poaching Engines	-	-	-	-	-	-	-	-	-	-	-	-	-	15/6	17/-
Rag Boilers	-	-	-	-	-	-	-	-	-	-	1/-	13/-	15/-	13/-	13/-
Cutters	-	-	-	-	-	-	-	-	-	-	1/-	15/-	15/6	15/6	15/6

Table 2 Some weekly wages in the Paper Industry in Scotland
(Pennyquik Area)

paid at two rates. Fourdrinier gave the amounts as 21/- and 15/- p.w.¹ but Scottish rates were lower than English; initially they were paid 13/- and 12/1 at Cowans but they rose after a month or two to 18/- and 14/-. Thus although "the most uninstructed person" was "competent to the purpose" the rate of pay was comparable to that of the vatman and his trainee.² Some new jobs too arose as a result of the introduction of the machine, such as Cutters, Tying up. The beatermen from early in the century gained parity with the vatman and as the mills expanded their numbers increased and included Breaking and Poaching Engines as well as Rag Boilers. It is noticeable however that the Cowan Valleyfield rates were sometimes higher than the rates for their Lasswade or Bank mills and from the evidence of M. R. Kennedy the "country" rates were lower than those at the large mills.³ On the whole then it would seem that the workers were not greatly displaced or depressed by the introduction of the machine. General wage fluctuations occurred throughout the structure of the industry and the machine men were as highly paid as any - except the foreman. Some of the rates are shown in Table 2.

Finally consideration will be given to the effect of the machine on the paper itself. One of the first effects, after the initial difficulties were overcome, was that the paper was of consistent quality, thickness and clarity. It is

1. PP. 1835. XX Fourdrinier Report Appendix A p.43.

2. In October 1822 Cowan's No. 1 machine man received £3:12:- for 24 days' work; the No. 1 vatman had £3:11:11.

3. Kennedy M.R. Reminiscences of a paper maker in the early nineteenth century American Paper Trade Journal 1885.

reported¹ that machine-made tub-sized writing paper from Cameron & Co. at Springfield got a penny per pound more than did the hand-made equivalent from Joynson² whose makes were held in as high repute as any. The report did not say, however, whether the machine was a Cameron or a Fourdrinier. A similar report for Polton mill said that when the Fourdrinier machine output was originally introduced into the market, it was eulogised ... and offered at a higher price than the hand-made.³

It is unfortunate that the excise returns from 1837 do not distinguish between the different sorts of paper. For the years 1831-1834 however a trend is discernible in some districts. Thus in Aberdeen, Haddington (taking in Pennycuik) and Glasgow, all rapidly expanding areas, the ratio of first-class to second-class paper was increasing. In Ayr and Stirling, and to a lesser extent Linlithgow, the trend was to an increase in second-class papers. It seems likely that this trend continued, particularly in the first three areas while in Fife as in Pennycuik (Haddington Collection) the amount of second-class paper was negligible. These areas of increasingly dominant first-class paper were those where the machines were early in use and it may be fair to suggest that one of the effects of the machine was to increase the importance of the finer grades of paper in Scottish production. Though figures are not available to confirm this, it is widely reported in the trade that this was the case.⁴ (See Table p.270.)

1. Gillis W.P.T.R. 6 September, 1913.

2. Joynson was a notable English maker who operated the mill at St. Mary Cray, Kent.

3. Gillis W.P.T.R. 24 January, 1913.

4. Information from Messrs. Collins Ltd., Tullis Russell, Cowan, Brown (Esk Mill), Bantams Ltd., and James Bantams Ltd. A. T. T. Davidson.

A further testimonial to the increasing excellence of the Scottish paper of the period was paid by John Dickinson. In a letter from London to Charles Longman at Nash Mills on 27th May 1833 after a visit to Scotland he wrote "... I arrived here this evening and left all friends in the North favorably dispos'd, but the makers there are really turning out capital paper, better than ever I saw before ..."¹

These examples show the high regard in which the "new" paper was held. With the use of the machine, a greater productivity was possible: the output per man employed rose. This was counterbalanced by the need for additional apparatus, sometimes extending to a steam engine and boilers, but on the whole the profit margins widened, enabling prices to be lowered as the machines came into more general use. There was a considerable rise in the price of paper from 1795 to about 1803, but this had returned to its previous level by 1819 or 1820. It would be unreasonable to attribute to the introduction of the machine the whole of the drop from its war-time peak. From 1825 to 1860 however there was a continuing fall and this may be attributed to the machine. Though many assorted prices have been traced, it has been difficult to find particular grades of paper throughout the series.

1. Letter in the possession of John Dickinson Evans, Kenya, quoted in Joan Evans, The Endless Web. London 1955. p.55.

Table

	Ratio	1st Class Paper :	2nd Class Paper	
	1831	1832	1833	1834
Aberdeen	2.7:1	3.4:1	3.9:1	4.1:1
Glasgow	3.8:1	4.1:1	3.3:1	8.3:1
Haddington	94:1	122:1	130:1	155:1
Fife	71:1	115:1	284:1	64:1 *
Ayr	1.04:1	1:1004	1:1.13	1:1.1
Stirling	2:1	1.3:1	1.5:1	1:1.1
Linlithgow	1.4:1	1.8:1	1.6:1	1.4:1

* The drop in the Fife ratio for 1834 coincided with the installation of a machine at Balbirnie which made poorer grades of paper. The Tullis mills at Auchmuty and Rothes produced predominantly fine papers.

However Imperial, Medium, Demy and Fine Foolscap have been found up to 1847 and Fine Hand at 1860. Imperial Brown Cap has also been noted for comparison with the white.¹ The prices have been expressed "per lb." and

1. S.R.O. Enrolment Books of Warrants. Nat. Lib. MS 6290 f.219-246., Cowans documents July 1846, April 1847. Letter Alex. Annandale to Jas. Dickson 7 March, 1846, John Dickson's stock lists, 1828, 1829, 1830, Tullis Russell Memo. book.

PAPER PRICES.

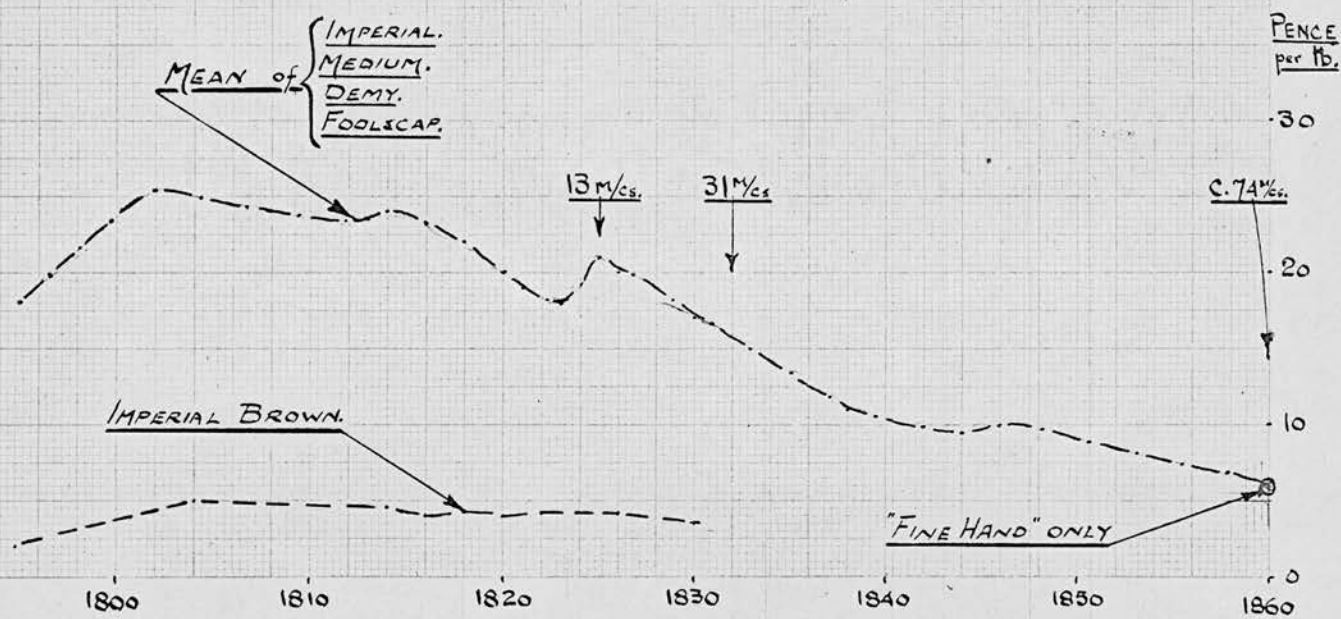


FIG. 4.

are higher than those quoted by Spicer¹ though his blanket "average price" for paper is perhaps a little misleading. Prices in Scotland, following the wages already noted, were lower than in England. This enabled the London market to be successfully invaded even after freight charges were met. The point also emerges in the letter from John Dickinson already quoted. He wrote "... it is extraordinary what a quantity of the enamell'd cards they use there. I think I must find out how they are done, and perhaps we could add it without much difficulty. We could command Double price for them ..."²

Fig. 4 shows the changes of paper prices in Scotland and it seems clear that the prices were determined by the machine mills as these predominated from about 1845, by which time some fifty machines had been installed in Scotland. Some of the traditional mills carried on for a time in competition with the machine-made paper, but as already discussed, there was no catering specifically for the small scale high quality hand-made demand, and the last vat in Scotland was closed not long after the period of this study. The uniformity of the machine-made paper, combined with the ability to have flow-line production, made the machine an economic necessity. The great increase in output per mill, from 150,000 lb. to 950,000 lb. per annum in 30 years provided

1. Spicer A.D. The Paper Trade p.86.

2. Letter from John Dickinson to Chas. Longman, 27 May, 1833. Also in April 1852 in a letter to John Evans he wrote "... Combe has been ... wanting cheaper paper for inferior books to compete with the Scotch. Their Pearl Bible ... they sell it for 6d. The Scotch have a common thin deprinted thing at 5d. and this annoys the Bible Society ..." Quoted in The Endless Web p. 68.

in the event, an adequate return for most of the manufacturers. This is confirmed by the continuance to this day, in modified form, of about a dozen businesses which were going concerns in the hand-made era¹ and have built their present position on the paper making machine. From 1824 to 1854 Scotland's contribution to the production of Great Britain rose from 10.7% to 22.2%.² This increase in the Scottish industry is also emphasised by the number of Hollander beaters in the mills. In Scotland in 1852 the average number per mill was just on 6: in England it was just over 4.³ It is clear that Scotland had mechanised her small complement to a high degree and was in a position to proceed with vigour to the use of a new raw material. In the last year of this study, 1861, Esparto grass was first used in Scotland.⁴ Though wood pulp was to appear later, esparto grass was widely and enthusiastically used in Scotland. Its treatment called for variations from the treatment given to rags and the Scottish paper making machine firms quickly adapted their products and became specialists in this field also.

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1. James Brown Esk Mills, Henry Bruce Kinleith, E. Collins Kelvindale, A. Cowan Valleyfield, Robt. Craig Caldercruix, Dalsholm Paper Co., C. Davidson Mugiemoss, Fife Paper Mills Balbirnie, A. Pirie Stoneywood, John Tod St. Leonard's, Wm. Tod (Jnr.) Springfield, R. Tullis Auchmuty and Rothes.
 2. Excise Library London and S.R.O. (derived from excise figures).
 3. PP. 1852 Vol. LI.
 4. Session Papers Vol. 595 No. 55 App. II (XIV) No. 402 of process, shows that in 1861 in the nine mills in the Esk area (Bank, Dalmore, Esk, Kevoek, Low, Polton, St. Leonards, Springfield and Valleyfield), some 148½ tons of Esparto (together with 6565 tons of rags) were used. By 1863, the Esparto figure had risen to 2215 tons.

Conclusion.

The paper industry in Scotland has now been traced from its tiny beginning in a poor country to a position of importance in the economy of the nineteenth century. The effect of the Union of 1707 on the whole Scottish economy was both profound and, in the long run, beneficial. Initially the political unrest militated against economic development, but from about 1746 onwards a change occurred. New mills were started and with the increased political stability, advantage was taken of the English market for the Scottish product.

During the second half of the eighteenth century the industry showed itself keenly alive to new ideas. This was certainly a reflection of the upsurge in Scotland of scientific and literary genius. There was close contact between the University world of thought and the Industrial application of new ideas. The development of chemical processes paved the way for the ready acceptance and treatment of the new raw materials of the nineteenth century. Arising out of their readiness to adopt new ideas, from their flexibility of process as well as of mind, the Scottish papermakers consolidated and developed their financial position. The pattern had arisen from copartneries and individuals whose continuing interest and influence are most clearly seen in the family enterprises. This interest through several generations was not confined to large owners of mills. Owners of small mills, as well as land owners and mill craftsmen all had a profound and continuing formative influence in the paper industry in Scotland. It is not without its significance that some of the largest concerns in the industry to-day - Collins of Kelvindale, Cowans of Valleyfield and

Davidsons of Mugiemoss as well as some of the smaller ones such as the Robertsons of Midcalder were founded and developed as family businesses, giving a core of stability to the industry. If to-day's combines have financial control in the larger examples this does not invalidate the conclusion that their foundation and development through the nineteenth century were family-derived.

The geographical structure or tree of the industry remained much as it had been for a hundred years but with some of the thinner growth removed. The industry contained both large and small units, but there were no monopolistic giants to dominate the whole. Consumption and production had increased complementarily to such an extent that one is tempted to see the rise as inevitable. Demand there certainly was, but even with the enormous expansion of industry and wealth, it was not a demand unrelated to price. It is fortunate that even with the increasing proportionate shortage of rags, other raw materials were found to sustain production. It is fruitless to speculate on what might have happened had there been no machine and no reduction in the price of paper. It seems likely, however, that in the engineering and inventive atmosphere of the nineteenth century, had there been no Robert or Cameron, no Dickinson or Cobb, someone else would have invented a paper making machine. The mechanics or chemical engineering of the process was well known and making paper by means of the "endless web" was surely not a more difficult concept than that of weaving endless webs of textiles. In the event, the paper industry in Scotland was well able to furnish the needs of Scotland's economy during the whole of the nineteenth century and to make an important contribution in the vital field of exports.

(1)

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ARTICLES

Concluded and agreed upon by the Society of the White-Writing and Printing paper Manufactory of *Scotland*, in a general Meeting at *Edinburgh* the Nineteen day of *August* One Thousand Six Hundred and Ninty Five Years, in the Terms whereof Partners are to be assumed.



Remo, That the Stock already advanced for carrying on the said White paper Manufactory, with what is yet to be Subscribed for, making up in whole *five Thousand Pound sterling*; and that the same be divided into Fourteen Hundred Shares: And that in respect of the great Charges and other Contingencies, which the Founders and those who have already subscribed have been put to, those who shall hereafter subscribe are to make payment of *four pound sterling* for each share, and that by and attour *Fifteen shillings sterling* of Subscription Money, which by the first Articles was provided payable to *Ni-*

A

chlas

(2)

Nicholas Dupin late Deput Governour of the Paper and Linnen Manufactories of *Scotland, England, and Ireland*, and *Denis Manes Esquire*, and is now assigned by them to the Joynt stock, in respect of an Liquid Sum obliged to be payed to them, and which they have accepted of in satisfaction for their said Subscription Money.

2^{do}. That all those who shall hereafter subscribe as Partners shall at the time of their respective subscriptions, pay in to *Alexander Clark* present Thesaurer to the Company; *One pound six shilling eight pence Sterling*, as the just equal third part of the fore-said sum of *Four pound Sterling* for each share, that they shall happen to subscribe for, together also with the fore-said sum of *Eighteen shilling Sterlings* of Subscription Money for each share they shall happen to subscribe for, or to any other Thesaurer who shall hereafter be named by pluralitie of Votes of the General Meeting for receiving thereof; and the remaining two parts of the saids shares, to be payed to the said *Alexander Clark* or his Successors in Office, how soon and whensoever the same shall be judged necessary by the General Meeting, or a Committee of seven persons to be chosen out of their Number for that effect; and that upon twenty one days Advertisement, to be given by the Thesaurer for the time being, to the subscribers personally, or at their dwelling places, if they be Residenters in *Scotland*, and to the Agents Residenters in *Edinburgh* for such Englishmen, or Residenters in *England* as have already subscribed, or shall hereafter subscribe as Partners, and who shall be payed by the English Subscribers, and upon their paying in of the first Moety with the subscription Money as a fore-said, and subscribing the Articles here ingrossed, the said *Alexander's* Receipt thereof to be produced at an General Meeting at *Edinburgh*, shall give the subscribers as full Interest in the said Manufactory effecting to their shares, as if they had originally subscribed the same.

3^{tio}. That albeit the first Moety and subscription Money a fore-said be payed in by the subscribers, yet if they shall hereafter fail

(3)

fail to pay in like manner the remaining part of their shares, they shall be subject and lyable to pay *Three shilling Sterling* Monthly for each third part of the share whereof they shall happen to fail in making due payment being required as aforesaid: And in case they fail for the space of three Months thereafter to make payment of the saids remaining shares and penalty, then & in that case their respective shares is to be disposed of by the foresaid society for the use of the Stock; and they are in all time thereafter to forfeit and amit any interest therein.

4^{to}. That there shall be two Books prepared by *Robert Henderson* our present Clark, or Secretary to the society, and his successors in Office, who are to be chosen at the General Meeting of the Company, in which all the Actings are to be Recorded; one whereof is to be still retained by himself while he is in the Office at *Edinburgh*, and thereafter delivered up with the grounds and warrands thereof to his Successor in Office, and the other thereof to be delivered by him to any person whom those who Reside in *England* do intrust therewith, to the effect that from time to time the Partners in *England*, may be by him certiorat of the proceedings of the Company: And which Clerk and person Intrusted by these in *England* are to be obliged not to remove these Books out of the Kingdom without warrand from the Company, under the penalty of *One hundred pounds Sterling*, each.

5^{to}. That no advantage shall be taken of survivancy; but that the share or shares of the party or parties Deceased shall fall and belong to their Heirs and Executors, and also that he or they shall have liberty to sell and dispose thereupon to any person or persons who will give most for the same; and their Assignes shall bruik and enjoy the same priviledges and Emoluments as their Authors might have done, they always producing their assignations & dispositions thereto at the first or second General Meeting after the purchase, which are to be recorded in the Registers or Transfer Books of the Company.

6^{to}. That at the first General Meeting every year there shall be chosen by plurality of Votes Thirteen persons of their own num-

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ber; who shall have power to nominate and choise an *Preses* or *Chairman* to the Meeting for the ensuing year out of the said Thirteen, whereof always the principal Agent for the English and Residenters in *England* is to be one if he be present, & which Thirteen whereof seven is declared to be an *Quorum* the *Preses* al ways being one of them by plurality of Votes are to order & determine in all their Meetings anent the Affaires relating to the Company, & to make all Contracts & Bargains relative thereto, & to give all necessary orders to the Thesaurer for debursements, and which Thirteen are to pass under the name of the *Common Council or Assistants to the Company*: As also the General Meeting is to make choice of Five persons out of the said Thirteen (the *Preses* or *Chairman* and the Agent for the Residenters in *England* being always two of them) as a Committee of Trade, and whereof any two with the *Preses* are to be an *Quorum* (the said Agent being likewise advertised of the Meeting) and which Committee and their *Quorum* shall have power, and are Authorized, to keep correspondence betwixt the English Partners and them, anent the Patterns and sale of Paper, and to settle and agree upon the manner of remitting the Money arising either from the product of the Joynt Stock or Subscriptions in *England*, to the Thesaurer of the Company that presently is or that shall happen to be at *Edinburgh*, for the time and which Committee are also to be warranted and impowered in case any of the Subscribers do not pay in their shares as aforesaid, to sell the same to any other person at the same price, as they were first subscribed for, such Purchasers and all other singular Successors being always subject to the whole Laws and Acts of the Company already made or to be made.

7^{mo}. That the four general meetings of the Company be kept at *Edinburgh*, annually upon the dayes following viz The first dyet upon the first Munday of *November*, the second upon the first Munday of *February*, the Third upon the first Munday of *May*, and the Fourth upon the First Munday of *August*, and that in case the foresaid Assistants find it necessary to have general meetings kept more frequently, or upon other dayes, that then the same shall

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shall proceed and be holden Intimation thereof being given to all Parties concerned by affixing placards upon the Mercat Cross and Exchange of *Edinburgh*, and upon the Entry's to the Exchange at *London*, bearing the day upon which the meeting is to be holden, and that Twenty dayes before the same, to the effect those Concerned in the Scots white-writing-Paper Company may give timous Instructions to their Agent or Agents residing at *Edinburgh* there anent.

8^{vo}. That the Thesaurer to the Company at present and in time coming shall be obliged to make their Accounts once every four Months anent what they have received in, what they have payed out, what debt is due to the company, by whom, & where. Lodged, & upon what security, & what is in their hands of Money and effects. As also by advice of the plurality of the English Subscribers and Cash-keeper or Thesaurer in *England*, is to be appointed who may receive in the Effects of the Manufactorie and Product thereof, and Money of the Several Subscribers there and be obliged to hold Count for, and remit the same to the Thesaurer of the said Office in *Scotland* once every three Months, and both of them are to give sufficient Security for that Effect.

9^{mo}. At all general Meetings of the Company each Party if present (or his Agent if absent) shall have one Vote for ilk five Shares he subscribes for but in Committies they are only to have one Vote what ever their Interest be,

10^{mo}. The Books for receiving in of Subscribers are not to be closed untill the whole Fourteen Hundred Shares be filled up without consent of the plurality of Votes at a general Meeting.

11^{mo}. That no Subscriber shall have liberty to subscribe for more than Twenty shares, without an Act of the general Meeting.

12^{mo}. That the Milnes shall be Built and all Expenses defrayed out of the Stock of the Company: As also the buying of Rags and all other materials necessary and the hyring of work men and maintenance of them and Prentices fit for the work, but it being already determin'd by such of the Company who

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who have already Subscribed, that there shall be two Milnes instantly Built, whereof one at *Zester* and another near *Edinburgh* whereof the saids *Nicholas Dupin*, and *Denis Manes*, are to have the oversight, in respect of the subscription Money allowed to them by the former Articles, and liquid sums now promitted to be payed to them in lieu thereof, the said *Nicholas Dupin* and *Denis Manes*, are to attend the Building of the saids Milnes, and to oversee the buying of all materials fit for the same on their own proper Charges, the Work Men and Materials being all payed out of the joynt Stock as aforesaid, and to teach Prentices the Art of making the said Paper, and not to desert the work untill these Prentices be able to manage the same, and teach others so to doe, conform to an Contract past betwix the saids *Nicholas Dupin*, and *Denis Manes* on the one part, and an Committie of the said company authorized for that Effect on the other part

13thio. In case any difference arise anent the carrying on of the said work and managing of the Stock, the same is to be determined by plurality of Votes of all the whole Proprietors or their Agents who are present at the first generall Meeting there after.

14tho. That it shall be in the power of the Proprietors or their Agents, by plurality of Votes to make such Laws for the Government of the said Paper Manufactorie as they shall think expedient at any Generall meeting, providing they be not repugnant to, or Inconsistent with the General Laws of this Kingdom.

Lastly. That whoever shall subscribe and take Share in the said Manufactorie, or who shall Succeed there to buy any title whatsoever shall be subject and lyable to all the Rules of the Societie made or to be made.

Here

(7)

Here follows a List of the
Members who have al-
ready Subscribed to the
above Articles.

JOHN Marquis of Tweeddale Lord High Commissioner of
Scotland
George Lord Viscount of Tarbat.
Sir James Stewart His Majesties *Advocat*.
Sir George Campbel Knight,
Alexander Clark Merchant.
Andrew Barclay Writer.
Andrew Johnston of Knock hill,
Andrew Duffe Merchant,
Archibald Scot Merchant,
David Robertson Writer,
Denis Manes Esquire.
Francis Borie,
George Bell. Merchant
George Lawson Merchant.
George Livingston Merchant,
George Mosman Book Seller,

(8)
Herman Le Dru,
Mr James Bailie Writer to His Majesties Signet,
James Hamilton Merchant,
James Montgomery Merchant at Glasgow,
James Stephens
Mr. James Young Writer,
Mr. John Buchan Advocat,
Mr. John Dickson Secretary to the Lord Chancellor,
Mr. John Inglis Writer to His Majesties Signet,
John Learmond Merchant,
John Lettice Smith,
Mr. John Meinzie's Advocat,
John Raitt Merchant,
Joby Trotter Merchant,
Laurence Wright Writer,
Mrs. Mary Flood
Nicholas Dupin, Esquire,
Patrick Farmer Merchant
Peter La Fite
Robert Henderson,
Thomas Butler Esquire
Thomas Noake Merchant,
Thomas Shelton Linnen Draper,
Thomas Spence Writer,
William Hume Master of the Gray Paper Mill at Aytoun
William Spence Warden to His Majesties Mint,

INSTRUCTIONS

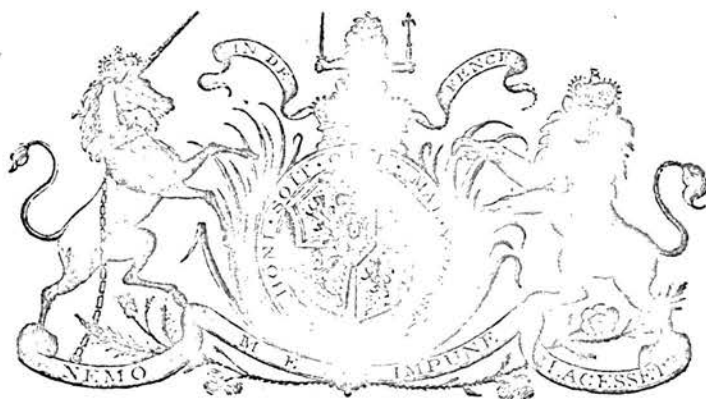


FOR THE

COLLECTORS, GENERAL SUPERVISORS,
GENERAL SURVEYOR, SUPERVISORS,
SURVEYORS, AND OFFICERS OF
EXCISE,

IN

SCOTLAND.



EDINBURGH:

PRINTED BY SIR D. HUNTER BLAIR AND J. BRUCE,
Printers to the King's most Excellent Majesty.

1804.

INSTRUCTIONS
FOR THE
OFFICERS OF EXCISE
WHO SURVEY
PAPER-MAKERS.

1. *Manner of making Paper.*

THE several sorts of paper are usually made of rags, ropes, cables, &c. ; the writing and printing paper of the finer rags ; the ordinary brown and whited brown paper of the coarser rags, ropes, &c.

The rags being sorted and washed, are put into mortars or engines ; four or five hammers are used to each mortar, wherein they are beaten into half stuff, then laid to mellow in tubs, binns, or chests, in some part of the mill, or in an outhouse. When they are mellowed enough, they are beaten again in the mortars till made into fine stuff, and are then fit to be manufactured into paper.

In the mill there is a vessel called a vat or vat, wherein the stuff that hath been so beaten is put to a sufficient quantity of water, and kept at a certain degree of heat, about lukewarm ; and this is the last preparation for paper.

According to the sorts and sizes of paper designed to be made, there are moulds to answer each size, (the bottoms of which are made of wire, somewhat resembling a fine sieve), which moulds are dipped into the vats, and by the dexterity and skill of the workman, are so handled, that the water runs through the wires of the moulds, and the beaten stuff only remaining therein, is gently turned off, or laid on a woollen cloth called a felt, and appears thereon as a perfect sheet of paper ; then another felt is laid upon that sheet, and again another sheet upon that felt, and so on till they have raised a heap of seven or eight quires, which is called a post. Sometimes the workmen will vary and make but five quires in

a post; which post being put into a press, and pressed very hard together, till the water is squeezed out, is immediately taken out again, and the sheets being taken from the felts, are laid one upon the other until the next day, and then hung in parcels of three, four, five sheets, or more, in each parcel, upon lines (usually called trebles) in the drying-house, where they have no certain time of hanging; but in the winter they hang much longer than in the summer. When the sheets are dry, they are taken down, flatted, and laid in piles, and then sized, that is, wetted in size; after that, the quantity of several reams being put one upon another, they are again pressed, a sufficient quantity of size being left therein for the bearing of ink.

Then they are hung up for drying a second time, in parcels of three or four sheets; and when dry again, are taken down from the lines; the broken sheets are separated from the good, and both counted into quires; after that they are pressed two or three times till made smooth, then tied up into reams for sale, viz. eighteen of the good quires, and two of the broken to each ream.

Brown and whited brown papers are made after the same manner, but sooner finished, being unsized, and but once hung up to dry before pressed, and made up into reams for sale.

2. *Entries and Licences.*

ALL makers of paper, pasteboard, millboard, scaleboard, and glazed paper, must make true and particular entry in writing of every mill, workhouse, warehouse, storehouse, room, and other place intended to be made use of by them for making, drying, or keeping paper, pasteboard, millboard, scaleboard, or glazed paper, or materials for making the same; and of all vats, presses, utensils, and vessels intended to be used in such manufactory, at the Office of Excise within the limits whereof such mill, &c. shall be situated. And you are to take care to see that the office-keepers, when they receive such entries, do immediately write upon each the day of the month and the year when they receive them, and sign their name thereto, and put them on a file, which must be carefully locked up. And you are, from time to time, as such entries are made, to copy the same into the entry book; and those copies are to be attested by the office-keeper: and as soon as possible after any such entry is made and copied, you are to repair to and desire the person who has given the same to shew you the places and utensils mentioned therein.

Every maker of paper, pasteboard, millboard, scaleboard, and glazed paper, must, before he begins, take out and pay duty for a licence, and renew the same annually ten days before the expiration thereof.

3. *Different Classes of Paper.*

You will observe, that all brown paper made of old ropes or cordage only, without separating or extracting the pitch or tar therefrom, and without any mixture of other materials therewith, is deemed paper of the second class; that

all other paper whatever (glazed paper for clothiers and hotpressers excepted) is deemed paper of the first class; and that millboard, scaleboard, and glazed paper, for clothiers and hotpressers, is deemed to be of the third class.

4. Surveying.

You must survey the paper-makers in your residence once a day at least, with returns at uncertain times; and those in your rides as often as is consistent with the nature of your division, or the security of such other parts of the revenue as shall be under your care.

You must, on every survey, go through the several entered drying rooms, and other places of the mill, sorting houses, and warehouses, and enter in the proper columns in your survey book, the condition of the mill, viz. whether at work or silent, and the several classes of paper on which the maker is at work, in the proper vat column, and also the condition of the dry presses, with the number of reams of paper of the first two classes, and the number of parcels of the third class which have been made up since your former survey, and also the whole of the uncharged stock, as in the precedent subjoined: When you receive, on survey, any notice to weigh and charge with duty any paper, &c. you are to insert the same in the columns for that purpose; and as soon as you make any charge thereon, you are to enter the same in the proper columns against the day of the month on which it was charged, agreeably to the following precedent.

You must also, on each survey, compare the largeness of the piles of finished paper not made up with what they were on your preceding survey, and with the quantities made up; and make such other observations from the folding, or otherwise, as may enable you to discover any fraudulent practice.

5. Specimen Papers.

You are to keep a specimen paper in every paper-maker's finishing room, and, on every survey, to make entry thereon conformably to the example herewith given; which specimens you must take up at the end of every quarter, and tie them together, and indorse the same with the name of the division, the rounds which they were for, and their number, also the paper-maker's name to whom each respectively belongs; and if any be missing, you are, on the outside specimen, to enter the name of such paper-makers whose specimens are wanting, and the reason thereof, which your supervisor is hereby enjoined to enquire into, and if it appear satisfactory, to sign his name thereto, or report the same to the Board.

6. How Paper, &c. must be made up.

ALL paper must, as soon as made, be made up into quires, each quire to consist of twenty-four sheets, and such quires must be forthwith made up into reams,

each ream to consist of twenty quires ; and all pasteboard, millboard, scaleboard, and glazed paper, must, as soon as made, be made up into regular parcels, each parcel containing even dozens of sheets of the same denomination, and of equal dimensions, and not less than twenty-four, nor more than seventy-two sheets in each parcel : And the makers must cause all such paper to be immediately tied up with strong thread or string, in covers or wrappers, containing one ream of paper each ; and all pasteboard, millboard, scaleboard, and glazed paper, to be tied up with strong thread or string, in parcels containing even dozens of sheets, and not less than twenty-four, nor more than seventy-two sheets in each parcel ; and the different parts of such thread or string must pass over and across each other at the middle of the ream or parcel respectively ; and where the different parts of such thread or string shall cross each other, the same must be passed from thence over and across the ends and sides of such ream or parcel respectively : And the maker must also, without delay, mark, write, or print, on each wrapper of paper, in large legible characters, and in words at length, the class of the paper inclosed therein, with the number of such ream, according to the number of such reams of each class made by him at such mill during the then current quarter of the year ; and on each parcel of pasteboard, millboard, scaleboard, and glazed paper, there must, in like manner, be marked, written, or printed, the true description of such parcel of pasteboard, millboard, scaleboard, or glazed paper, made by him at such mill in each such quarter. If any maker under your survey shall neglect or refuse to make up his paper, &c. in the manner before mentioned, you are forthwith to inform your collector or supervisor thereof, that he may be prosecuted for the penalties incurred for such neglect or refusal.

You will observe, that paper-makers are allowed to make their paper into quires without folding the same, such quires, when made up into reams, being separated by a slip of coloured paper placed between each quire, and visible on the outside of the ream ; and to make the outside quires of each ream of paper to consist of not less than twenty, nor exceeding twenty-four sheets ; they are also permitted to divide their paper with a knife or other instrument before it is tied up in reams, provided that the quantity of paper chargeable with duty be not lessened thereby ; and that all paper so divided be distinguished on the wrapper by the words *Cut Paper*.

8. Notice before Weighing.

You are to observe, that every maker whose mill, &c. is so situated as to be surveyed every day, is obliged to give twenty-four hours previous notice in writing, and every paper-maker whose mill, &c. is not so situated, is obliged to give forty-eight hours previous notice in writing, of the particular hour and time of the day when paper, pasteboard, millboard, scaleboard, and glazed paper, is intended to be weighed and charged with duty ; and you must attend at the time mentioned in such notice, or as soon after as the nature of

the other business under your survey will possibly admit ; and the maker, or his servant, must produce to you all the paper, &c. intended to be charged, inclosed, or tied up, in the manner before mentioned. And in case any maker does not, at the hour and time mentioned in his notice, produce to you the goods then to be charged, tied up, and the proper class and other matters marked on the cover or wrapper of each ream and parcel, such notice is void ; and he is obliged to give a fresh and like notice, before such goods be taken account of or charged with duty, and before he shall remove or send away the same from the mill where made.

8. Directions for Weighing and Stamping.

WHEN any paper, &c. shall be presented to you to be weighed and charged with duty, you are carefully to observe that it is really of the quality declared by the trader, that the declaration and progressive number are fairly and distinctly marked on the wrapper of each ream of paper, and on each parcel of millboard, scaleboard, and glazed paper : And when you are satisfied that all the conditions of the law have been complied with, and after you have ascertained the weight, you are forthwith to stamp every ream of paper, and every parcel of millboard, scaleboard, and glazed paper, with the stamp sent you by the Commissioners, to denote the charging of the duty ; and write your name on every such ream and parcel, with the date, day, and year, in which the duty was charged.

Before you begin to weigh, you must take care that the scales be exactly balanced, and that the weights be true, and frequently exchange the ends, by putting the weights sometimes into one scale, and sometimes into the other, that you may not be imposed upon by a false beam ; and in weighing, you are to give the turn of the scale in favour of the Crown, and in lieu thereof to allow the maker two pounds upon every hundred pounds.

You are immediately to enter each draught as it is weighed off, in a part prepared for that purpose at the end of your book, and to mark the same as soon as taken out of the scales ; and from the total of the draughts of each class respectively weighed at a time, you are to deduct the allowance of two pounds in the hundred, and insert the remainder in the proper columns of the right hand page in the body of your survey book.

If any paper is presented to you to be charged with duty and stamped, in any wise cut or diminished, you are to seize the same, and also to record the trader for prosecution for the penalty incurred for such offence.

You must be very careful of the stamp committed to your care ; for, if you lose it, you will be discharged from your employment ; and that no fraudulent use may be made thereof, when you have not any occasion to carry it about with you, it must be locked up in safety, and you must always keep the key yourself : And at the charging of paper, &c. you are by no means, and under no pretence whatever, to allow the trader or his servants to get the stamp into their hands ; but you must stamp each ream, bundle, and parcel yourself, so as effectually to pre-

vent any imposition, by substituting a larger quantity of goods to be stamped than what is really weighed and charged with duty.

You must always keep your stamp clean, so that the impression thereof may be as fair as possible; and you are to keep a fair impression of the stamp on the blank leaf at the beginning of each survey book.

9. *Pasteboard.*

You will observe, that no maker of pasteboard can carry on the business of a maker of paper, nor carry on the business of making pasteboard, within a quarter of a mile of any paper-mill or manufactory.

You will also observe, that no pasteboard is to be made of any materials whatever, except paper which shall have been charged with the full duties of Excise payable thereon, and which shall not have been written or printed on, or previously used for any purpose whatever; and before any maker of pasteboard begins to make any paper into pasteboard, he must produce to the proper officer the paper intended to be made into pasteboard, in the original covers or wrappers in which the same was charged, and having the Excise duty stamp fair and legible on each ream; and must take the covers from the paper in the presence of the officer, who is thereupon to take an account of such paper, and destroy the duty stamp on each wrapper; and that the officer may be enabled to attend, examine, and take account of such paper, the maker of pasteboard must give him twenty-four hours notice in writing, of the day and hour when he intends to produce such paper.

You are to survey all makers of pasteboard in your division, in the same manner as makers of paper; and you must keep an account of the respective parcels of pasteboard made up and stamped, as if the duty was to be paid for the same.

10. *Samples.*

For the better discovery of impositions, as well as frauds, in the classing of papers, you are empowered to untie and open any ream of paper, and to take out, by way of sample, one or more sheets, not exceeding one sheet out of each quire, paying (if demanded) the market price thereof; and if you discover therein any paper of a different class than that marked on the wrapper, such ream is forfeited, and may be seized.

And where you shall have any doubt respecting the classing of any paper, you are to take a sample thereof, and write thereon the maker's name, the day when charged, the quantity, and class wherein charged, and carry the same to your collector and supervisor, to be viewed by them, and compared with the samples of paper made and charged at other places.

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11. *Paper may be removed from one Mill to another to be finished.*

You will observe, that any maker of paper may send paper from the mill where the same shall be made, to any other mill to be sized or finished, upon his giving forty-eight hours notice in writing, to the officer under whose survey the mill where the paper was made shall be, that he may attend and take an account thereof: And such officer is to give a certificate, to accompany such paper, expressing the name of the maker, and the place where made, the class, and the number of reams thereof, with the name and residence of the person to whom it is sent, and the day on which such certificate is granted. And such paper, when so removed to the mill or place where it is to be sized, or made fit for use, is to be under the like regulations as to stamping, marking, labelling, and other things, as if it had been finished or sized at the mill where made.

You are to prepare schemes at the end of your book, agreeably to the precedents at the end of these instructions, into which you are to insert the contents of each certificate you grant with paper sent from one mill to another in order to be finished; and of each certificate you shall receive with paper which shall be sent to any mill under your survey in order to be finished there.

12. *Description of the several Sorts of Paper, with what is usually deemed a Day's Work.*

To assist you in estimating the quantities of paper made at the mills under your survey, there is subjoined a description of the several sorts of paper usually made in *Scotland*, by shewing the length and breadth of each sheet, and the weight of a ream, together with what is usually reckoned a day's work on each sort; and you will observe, that, though the dimensions of the paper are not the same in every mill, yet the difference in length or breadth is so very little, that they may be easily known from other sorts.

Names of Paper.	Dimensions.		Weight.	Reams of each Sort usually made in a Day.
	Length.	Breadth.		
Super Royal,	$19\frac{1}{4}$	by $27\frac{1}{2}$	54	4
Writing Royal,	$19\frac{1}{4}$	by 24	42	5
Printing Royal,	$19\frac{1}{2}$	by $24\frac{1}{4}$	27	5
Writing Medium,	$17\frac{1}{2}$	by $22\frac{1}{2}$	33	$5\frac{1}{2}$
Printing Medium,	18	by 23	23	$5\frac{1}{2}$
		and		
	$17\frac{1}{2}$	by 22		
Writing Demy,	$15\frac{1}{2}$	by 20	24	7
	17	by 22		

Names of Paper.	Dimensions.		Weight.	Reams of each Sort usually made in a Day.
	Length.	Breadth.		
Printing Demy,	$15\frac{1}{2}$	by 20	20	7
Large thick Post,	$15\frac{1}{4}$	by $19\frac{1}{2}$	20	7
Large thin Post,	$15\frac{1}{4}$	by $19\frac{1}{2}$	16	7
Small thick Post,	$13\frac{1}{2}$	by $16\frac{1}{2}$	18	8
Small thin Post,	$13\frac{1}{2}$	by $16\frac{1}{2}$	$13\frac{1}{2}$	8
Foolscap,	$13\frac{1}{2}$	by $16\frac{1}{4}$	14	9 or 10
Pot,	$12\frac{1}{2}$	by $15\frac{1}{2}$	$9\frac{1}{2}$	9 or 10
Bible Crown,	21	by $16\frac{3}{4}$	14	8
Ordinary printing Crown, and Tea,	15	by 20	13	8
Blue Demy,	17	by 22	18 to 20	7
Blossom,	17	by 22	18 to 20	7
Cartridge,	21	by 26	35 to 45	4 to 5
Elephant,	$24\frac{1}{2}$	by $25\frac{1}{2}$	60	4
Royal Brown,	23	by 28	42	$6\frac{1}{2}$
Small Hand, or Common Gray,	24	by $19\frac{1}{4}$	16 to 18	8

13. Ways of committing Frauds, and how to prevent or detect them.

It having been discovered, that paper-makers have written the declaration of the quality of their paper close at the upper edge of the wrapper, when the progressive number, date of charge, and officer's name, were written at some distance below, and afterwards shifted this wrapper from a second class paper, cut off the declaration, put on a new one, and applied it to a ream of paper of the first class; to prevent such impositions, you must insist with the paper-makers to write the declaration of the quality a little down from the upper edge of the wrapper; and whether this is complied with or not, you must, in every case, be careful to put the date and your signature parallel to the declaration, and not below it, so as the one cannot be cut off without the other.

It has also been discovered, that paper-makers have greatly evaded the duty, by making the wrappers covering small light reams of a larger size than the paper inclosed by them, and by being either folded in at the ends, or plaited or doubled in the middle, or at the sides, before being put on, they are made to fit the paper first contained in them, and at the same time to admit of being afterwards taken off, stretched out, and applied to cover reams of large heavy paper, and yet the flaps meet, and every thing appears fair. In order to prevent such

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practices, you must stamp every plait or joining of the wrapper, so that if it is afterwards attempted to be stretched out, the impression being divided, the fraud may be easily detected.

As considerable quantities of paper have been conveyed away from the mills without having been charged with the duty, and without wrapper, string, or any cover, packed up in chests or boxes, (which are commonly made on purpose to contain an exact number of reams), and also when made up into reams, you are to exert your utmost vigilance in discovering such frauds, by examining all suspicious packages in the paper-makers' warehouses, and also their carts, when removing paper from the mill.

The duties have also been greatly evaded, by the paper-makers procuring a return of the wrappers which had been sent with goods to their customers, and to their own warehouses in towns; and by paper-makers sending their carts with paper through the country, and selling it in quantities less than a ream to merchants, dealers, and others, and carrying back the stamped covers or wrappers to the mill: You must therefore use your best endeavours, by frequent and close inspection of both the charged and uncharged stocks of the paper-makers, and of the quantities making up at the mills, to prevent the revenue being defrauded, by these wrappers being again used to cover paper which has not been charged with duty.

And you must, by circumspection and observation on survey, and in every possible manner, endeavour to prevent paper that has not been charged with duty being used in the making of pasteboard.

14. *Stationers and Dealers.*

You are frequently to inspect the warehouses of stationers and dealers in paper (with a warrant, if refused); and you are, on every occasion, to examine the paper you find in the possession of the dealers in excisable commodities under your survey, in order to discover any fraud that may be committed by the running of paper from the mills to such persons that has not been charged with the duty, and to see that they destroy the wrappers, upon opening for sale the reams of paper to which they were affixed.

15. *Entry of Paper, and Payment of Duties.*

ALL makers of paper, pasteboard, millboard, scaleboard, and glazed paper, must make true entries in writing, every six weeks, at the next Office of Excise; of all the paper, pasteboard, millboard, scaleboard, and glazed paper, by them made within that time; and a new entry paper must be left at each trader's house on the last survey in each round, and the old entry paper taken thence to the Office, that, at the sitting, the collector or supervisor may compare it with the survey book, and administer the oath or affirmation to the traders, or to such

proper servant as they shall appoint; which entries are to be put upon a file, with a blank paper betwixt each round: And every such maker must, within six weeks after he shall make or ought to have made his entry, clear off the duties for all such paper, millboard, scaleboard, and glazed paper.

16. Allowance to Persons in the Woollen Manufactory.

EVERY clothier, hotpresser, and other person in the woollen manufactory, who intends to apply for the drawback for glazed paper and press paper, employed in pressing woollen cloths or stuffs, must, before he use any such paper, produce the same in the original covers or wrappers in which it was charged with duty, to the proper officer of Excise appointed to take an account thereof, and give him a notice in writing, specifying the day and hour he intends to produce such paper, the quantity to be produced, the name and residence of the maker or person from whom the same was received, and the time when received; and must untie and open all such paper in the presence of the officer, who is to examine and take an account thereof, and destroy the duty stamp on the wrappers.

Upon application to the collector of the collection in which any such person shall reside, as soon as any glazed paper, or press paper, has been so much used as to be incapable of being employed for any purpose whatever, (such application not being made oftener than twice in a year), stating in writing the quantity so used, and making oath before such collector of the real quantity so used; that the same has been actually and *bona fide* employed in pressing woollen cloths or stuffs by him, and for no other purpose; that it is by such use rendered unfit for any other purpose; and that no drawback has been before received for the same; the collector is to pay the drawback of the duties which shall appear to have been charged or paid for such paper.

The officers who shall be appointed to take an account of glazed paper and pressed paper so used, are to enter in their respective books the weight thereof; and, at the time any person shall apply to the collector for the drawback, deliver to such collector an account of the weight of paper taken account of by them with such person, for the purpose of being employed in the pressing of woollen cloths or stuffs by him, since he last claimed his drawback.

And supervisors and officers are to exert themselves to discover whether any paper, taken account of for being used in pressing woollen cloths or stuffs, has been applied to any other purpose, and inform the proper collector thereof, who is to withhold payment of the drawback until the directions of the Board be obtained.

17. Reference to General Instructions.

As to entering a scheme of your division, a list of the traders' entered places, and the amounts of the rounds in the front of your book, making up your

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vouchers, and attending the collector therewith at the fitting, and, upon a remove, leaving your instructions, stamp, acts of Parliament, and general letters, with your successor: Your forbearance of erasing, obliterating, or altering letters or figures, entering of feigned surveys, taking of fees, compounding of frauds, receiving of duty, or taking up arrears, without the collector's directions in writing, or a legal warrant; with what other injunctions and restrictions are in your general instructions, which may be applicable to this duty, and are not herein particularly expressed, you must, in every respect, observe and comply with, as if they were actually repeated in these instructions.

Valleyfield, CHARLES COWAN,

Months and Days.	Condition of the Mill.	Condition of the Vats.				Condition of the Dry Presses.					
		1	2	3	4	1	2	3	4	5	6
1802. July 5 E 7	At work.	1 Clafs.	1 Clafs.	Silent.	1 Clafs.	F	F	F ^s	O	F	F
6 M p 8	D°	D°	D°	1 Clafs.	2 Clafs.	F	F	F	F ^s	O	O
6 E p 4	D°	D°	D°	D°	2 Clafs. Silent.	O	F	F	F	F	F ^s
7 M 7	D°	D°	D°	D°	2 Clafs.	O	O	F	F ^s	F	F
7 M 11	D°	D°	D°	D°	D°	F	F	O	F	O	F ^s
8 M 6	Silent.	D°	Silent.	D°	D°	F	F	F ^s	O	F ^s	F
9 M 8	At work.	D°	1 Clafs.	D°	1 Clafs.	F	O	F	F	F	F ^s
9 E 3	D°	D°	D°	D°	D°	F ^s	F ^s	F	F	O	F
									Total	—	—
									Total charged		
July 9 E 3	At work.	1 Clafs.	1 Clafs.	1 Clafs.	1 Clafs.	F ^s	F ^s	F	F	O	F

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Paper-Maker.

Paper, &c. made up.			Notice to Weigh.	Paper, &c. charged.						
Reams of 1st Clafs.	Reams of 2d Clafs.	Parcels of 3d Clafs.		1st Clafs.		2d Clafs.		3d Clafs.		
				Reams.	Lbs.	Reams.	Lbs.	Parcels.	Lbs.	
244	108	48	July 6 M 6	—	—	—	—	—	23	Transfer.
48	—	—	7 M 6	168	2811	78	1475	24	1858	
—	04	—	— —	—	—	—	—	—	—	
132	—	—	— —	120	1485	06	104	—	—	
—	—	—	— —	—	—	—	—	—	—	
68	12	10	9 M 6	—	—	—	—	—	—	
148	—	—	10 M 10	44	1638	—	—	—	—	
—	07	—	— —	—	—	—	—	—	—	
640	131	58	10 M 10	332	5934	84	1579	24	1881	74: 3:6 9:17:4½ 17:11:9 — L. 101:12:7½
332	84	24							16½	
308	47	34		Transferred to next Book,					—	
						5934	lbs. at 3 d. per	lb.	L.	
						1579	lbs. at 1½ d. per	lb.		
						16½	cwt. at 1l. 1s.	—		
						1st Round Duty,			L.	

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CHARLES COWAN, Draughts.

N ^o	W ^t	N ^o	W ^t
July 6th. 1st Clafs. Reams.		July 7th. 1st Clafs. Reams.	
10	331	10	231
10	331	10	240
20	401	10	201
20	402	10	140
20	301	20	175
20	301	20	176
20	320	20	176
24	240	20	176
24	241		
168	2868	120	1515
Allowed	57	Allowed	30
	2811		1485
2d Clafs. Reams.		2d Clafs. Reams.	
25	375	06	106
25	376	Allowed	02
16	640		104
12	114		
78	1505	July 9th. 1st Clafs. Reams.	
Allowed	30	06	432
	1475	06	324
3d Clafs. Parcels.		10	420
06	672	10	270
06	672	12	225
06	275	44	1671
06	277	Allowed	33
			1638
24	1896		
Allowed	38		
	1858		

CHARLES COWAN, Progressive N^{os} of Reams and Parcels of Paper, &c. made up and charged.

Date of Charge.	N ^{os} of 1st Clafs.	N ^{os} of 2d Clafs.	N ^{os} of 3d Clafs.
July 6 M p 8	1 and 168	1 and 78	1 and 24
7 M 7	169 and 288	79 and 84	—
9 M 8	289 and 332	—	—

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FORM OF A SPECIMEN PAPER.

Pennycuik Divⁿ. } CHARLES COWAN, Paper-maker.
Valleyfield Mill,

Time of Survey.	Condi- tion of the Mill.	Condition of the Vats.				Paper &c. made up.			Notice to weigh.	Paper, &c. charged.					
		1	2	3	4	Reams of 1st Clafs.	Reams of 2d Clafs.	Parcels of 3d Clafs.		1st Clafs.		2d Clafs.		3d Clafs.	
										Reams	Lbs	Reams	Lbs	Parcels	Lbs
5 E 7	At work	1 Clafs	1 Clafs	Silt	1 Clafs	244	108	48	6 M 6	Trans-	fer.	—	—	—	23
6 Mp 8	D°	D°	D°	1 Clafs	2 Clafs	48	—	—	7 M 6	168	2811	78	1475	24	1858
6 Ep 4	D°	D°	D°	D°	Silent	}	04	—	—	—	—	—	—	—	—
7 M 7	D°	D°	D°	D°	2 Clafs										
7 M 11	D°	D°	D°	D°	D°	—	—	—	—	—	—	—	—	—	—
8 M 6	Silent	D°	Silt	D°	D°	68	12	10	9 M 6	—	—	—	—	—	—
9 M 8	At work	D°	1 Clafs	D°	1 Clafs	148	—	—	10 M 10	44	1638	—	—	—	—
9 E 3	D°	D°	D°	D°	D°	—	07	—	—	—	—	—	—	—	—
	Total,	—	—	—	—	640	131	58	—	332	5934	84	1579	24	1881
	Total charged,	—	—	—	—	332	84	24	—	—	—	—	—	—	161
9 E 3	At work	1 Clafs	1 Clafs	1 Clafs	1 Clafs	308	47	34	10 M 10	Trans-	ferred to N.B.	—	—	—	05

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Auchindinny, GEORGE CADDEL, Pasteboard-maker.

Months and Days.	Condition of the Presses.			Reams of Paper in Stock.	Notice to open Paper.	Reams of Paper opened.	Parcels of Paste- board made up.	Notice to Mark.	Parcels of Paste- board stamp'd	Towhat Number stamp'd.
	1	2	3							
July 5 M 10	At w ^k	Sil ^t	At w ^k	44	—	—	18	—	—	Transfer
6 M p 9	D ^o	At w ^k	D ^o	56	7 M 8	—	03	7 M 8	—	—
7 M p 8	D ^o	D ^o	D ^o	22	—	34	06	8 M 8	18	18
8 M p 8	Sil ^t	Sil ^t	At w ^k	22	9 M 11	—	—	—	09	27
8 E 5	D ^o	D ^o	D ^o	22	—	—	12	—	—	—
9 N ^a	D ^o	D ^o	D ^o	60	—	26	04	10 M 11	—	—
					Total,	—	43		27	
					Total stamp'd,		27			
July 9 N ^a	Sil ^t	Sil ^t	At w ^k	60	—	—	16	10 M 11	To be transf'd	

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ENTRY AT BOOK END.

Time of Entry, and Traders Names.	Time of Weighing, &c.
July 6 M 10 M p 8 Charles Cowan — — M p 8 D ^o Cowan, N. to weigh M p 9 George Caddel, N. to open M p 9 D ^o Caddel, N. to mark None else.	1 Cha. 7 M 6 7 M 8 7 M 8
7 M 9 M 7 Charles Cowan — — M p 8 George Caddel, N. to mark None else.	1 Cha. 3 M 8
8 M 9 M 6 Charles Cowan, N. to weigh M p 8 George Caddel, N. to open None else.	7 M 6 7 M 11
9 M p 8 M 8 Charles Cowan — — M 8 D ^o Cowan, N. to weigh None else.	1 Cha. 10 M 10
9 Ent ^d 10 M 9 N ^o George Caddel, N. to mark None else.	10 M 11

SCHEME OF CERTIFICATES granted with Paper sent from the Mill where made to another Mill to be finished.

From whom sent.	Name of the Mill.	To whom sent.	To what Mill.	Date of Notice to remove such Paper.	Date of Certificate.	Reams of 1st Clafs.	Reams of 2d Clafs.	Dozens of Sheets of 3d Clafs.	Officer's Name by whom the Certificate is granted.
Charles Cowan,	Valleyfield,	William Simpson,	Lafswade,	July 7	July 9	48	—	36	William Turner.

SCHEME OF CERTIFICATES received with Paper sent from the Mill where made to another Mill to be finished.

To whom sent.	To what Mill.	From whom sent.	From what Mill.	Date of Certificate.	Reams of 1st Clafs.	Reams of 2d Clafs.	Dozens of Sheets of 3d Clafs.	Time when Certificate received.	Officer's Name by whom the Certificate is granted.
Charles Cowan,	Valleyfield,	Robert Ker,	Ayton,	June 28	24	—	120	July 6	David Home.

Explanation of the foregoing Precedents.

IN the specimen of the paper survey book, on the first line stands the transfer from the preceding round, viz. the date of the last survey in old book, the condition of the vats and dry presses, the number of reams of the first and second classes, and parcels of the third class made up and not weighed and stamped, and the notice depending for weighing. Then follow the surveys, the first visit being on July 6 M p 8 when the mill was at work, viz. beating rags into stuff to be made into paper; the first, second, and third vats at work on fine stuff, or paper of the first class, and the fourth at work on coarse stuff made of ropes, or paper of the second class; and there were found 48 reams of paper of the first class made up, by which the dry presses N^{os} 5. and 6. were emptied; at the same time there is a notice to weigh on the 7 M 6, and the transferred notice is discharged by weighing and stamping 168 reams of the first class, 2811 lbs.; 78 reams of the second class, 1475 lbs.; and 24 parcels of the third class, 1858 lbs. set forth in their proper columns; and the said survey is agreeable to the draughts, scheme of numbers, remarks, and specimen paper. On the 6 E p 4, the men having done work on the 4th vat, the word silent was entered in the column, and over it the class of paper on which they had been at work.

In the specimen of a survey book on a pasteboard-maker, on the first line stands the transfer, viz. the date of the last survey in the old book, the condition of the presses, the number of reams of paper in stock not opened, and the number of parcels of pasteboard made up and not stamped. On the first survey July 6 M p 9, it appears that the trader had received 12 reams of paper, the stock being 56 reams, and there are three additional parcels of pasteboard made up; on this survey, there is a notice given to open paper for being made into pasteboard, and also to stamp pasteboard made up on the 7 M 8, which notices are discharged on the 7 M p 8, by opening 34 reams of paper, and marking 18 parcels of pasteboard.

The balancing of the books at the close needs no explanation.

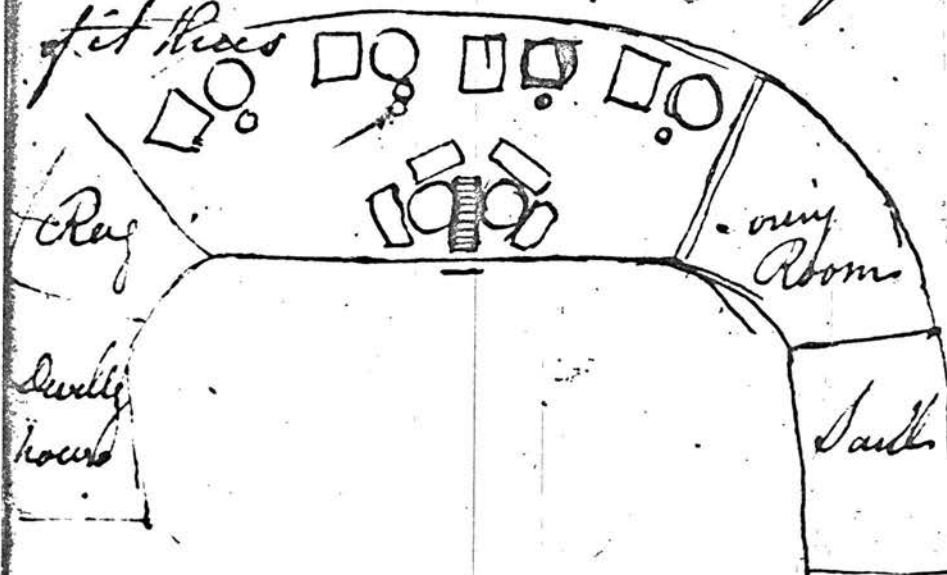
JOSHUA GILPIN

Joshua Gilpin (1765-1841) was the son of a prosperous Philadelphia merchant. In 1787 he founded the first paper mill in Delaware on Brandywine Creek. His brother Thomas (1776-1853) joined him in the project and was left in charge of the mill when Joshua set off on his first tour of Europe. This lasted from 1795 till 1801 and was carefully written up in his Journal of sixty-two notebook-sized volumes. In volume four is his account of his Scottish experiences. A part of this is reproduced in this Appendix, as its contemporary account of 18th century Scottish practice, with diagrams, is a most important source of information. The Brandywine mill was not only famous but successful during most of its productive life of fifty years - despite a disastrous flood in 1822 and fire in 1825. The importance of the mill, and therefore of the Gilpins, rested not only on the fine quality of their paper but also on the fact that they introduced the chemical approach to papermaking in the United States. Their mill was the scene of the first use of chlorine for rag bleaching in that country. Moreover, their 1816 patent for a cylinder type papermaking machine put them ahead in this important field of mechanisation. The journals are preserved in the Pennsylvania State Archives at Harrisburg, Pennsylvania. The papermaking machine is in the Hagley Museum near Wilmington, Delaware. Further information on the Gilpins is in "Thomas and Joshua Gilpin, Papermakers" by Hancock and Wilkinson and "Papermaker Joshua Gilpin" by Edelstein in the Paper Maker Vol.27 No.2 and Vol.30 No.2 respectively.

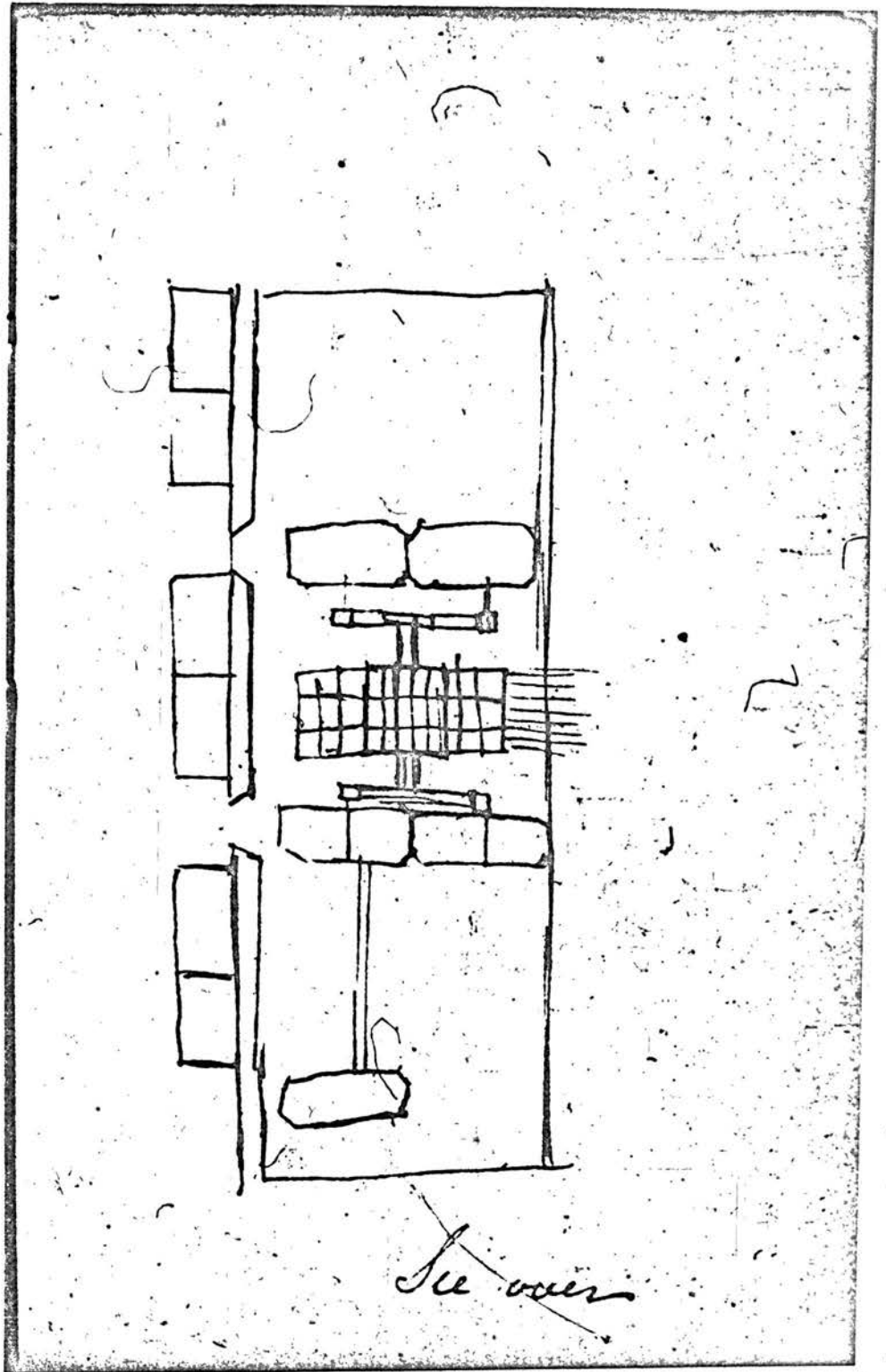
— Mr. Robertson is absent
during the rest of 1780. called
on the 8th & 9th in y^e called —
saw a number of specimens of
iron, basalt, spar from
Athens Seat —

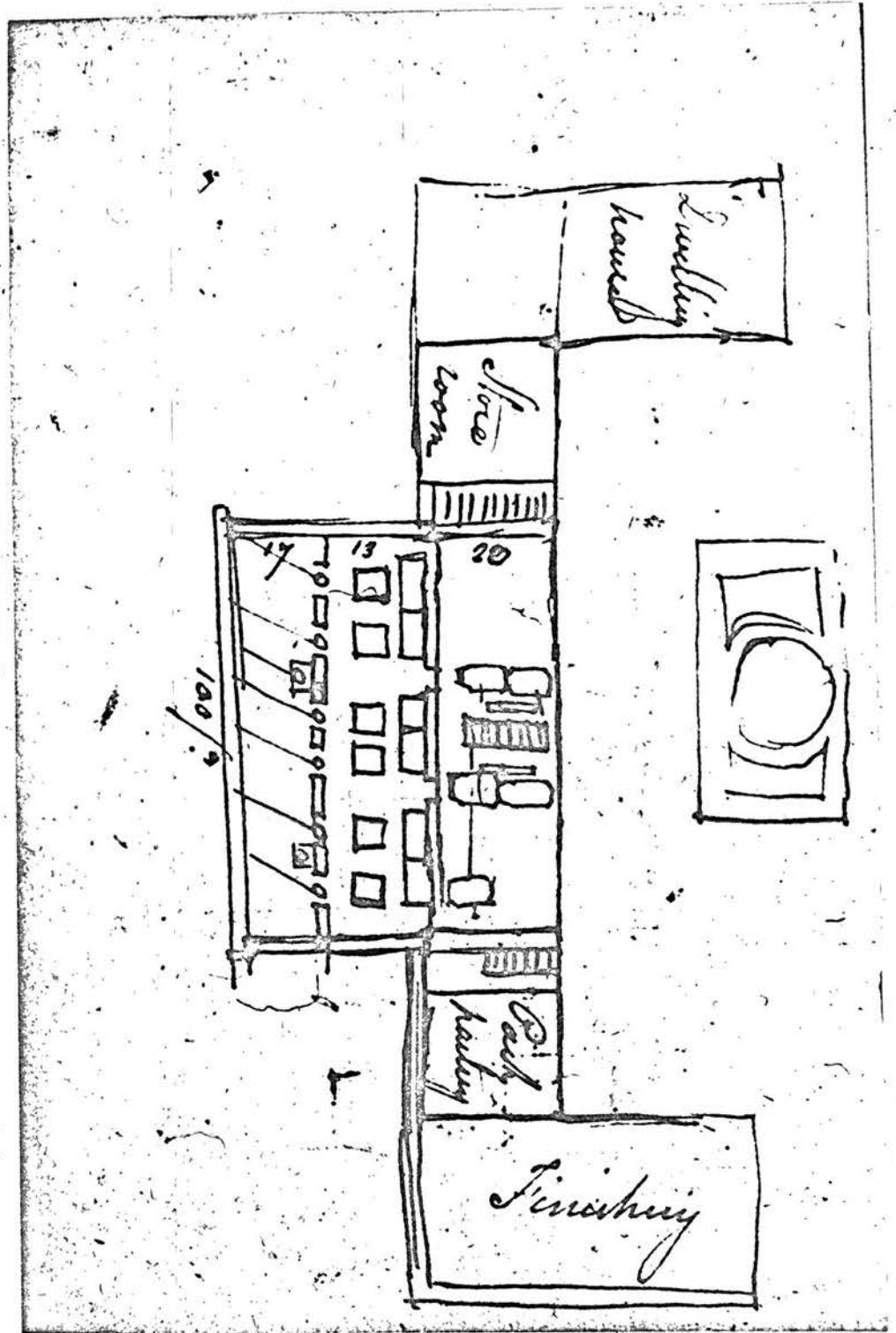
14th rose at 8. breakfasted at 9 at
10 set off for Polton Bank. went
south from E. — country very fine
romantic & highly cultivated. at
11 reached Polton on the south side
of a fine vale watered by y^e E. —
— went to ~~Blackthorn~~ the hills on
each side having ascents & beauti-
fully wooded. saw ~~and~~ ~~the~~ in
to drive to W. William Simpson
Mill — his foreman Alex. Steven-
son showed us y^e Mill, and old

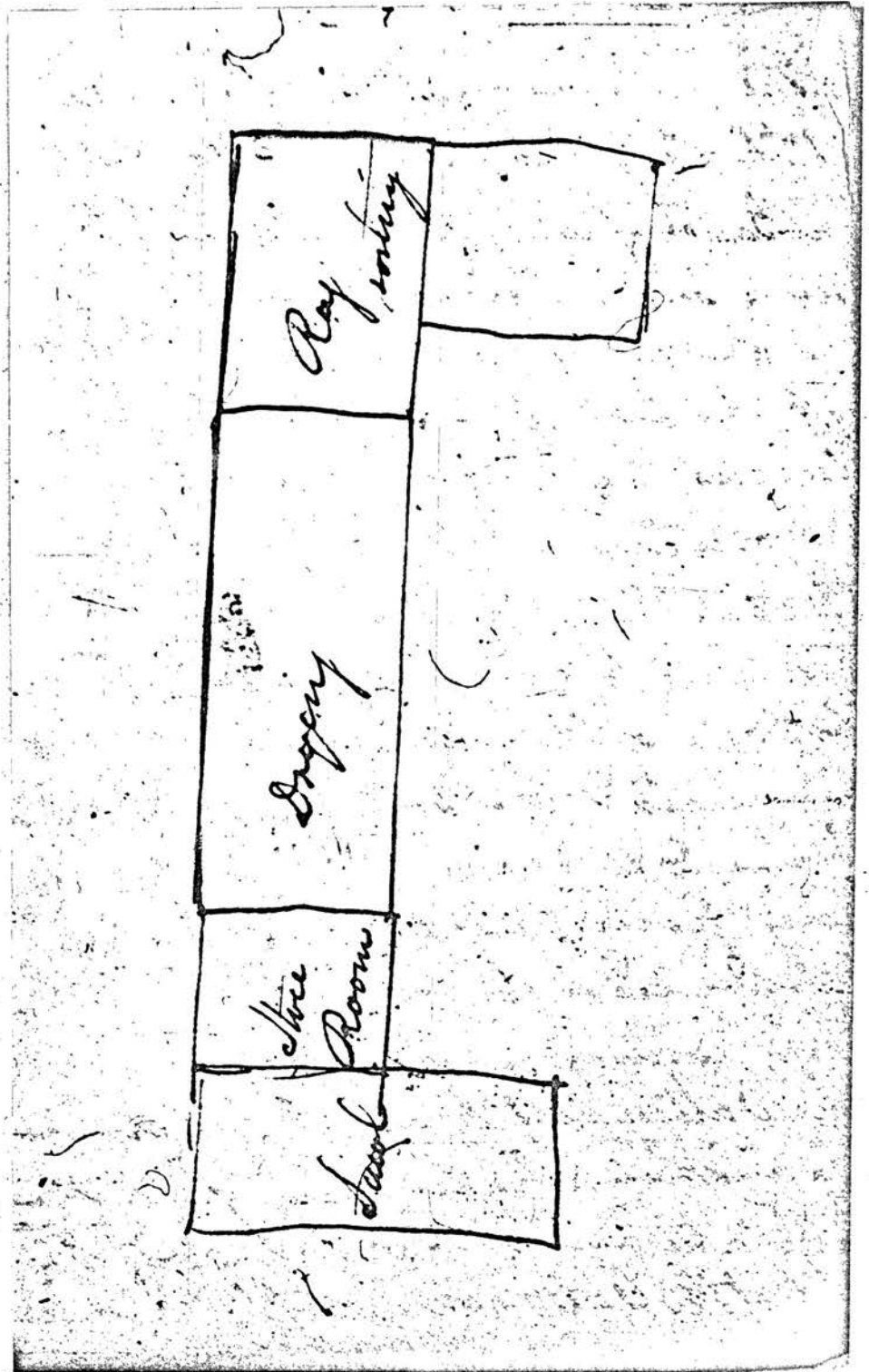
but many improvements I
had not seen - the general form
of it thus



From hence I went to W Pitman
Mill which is on a better plan
the general form of it delineated
thus.

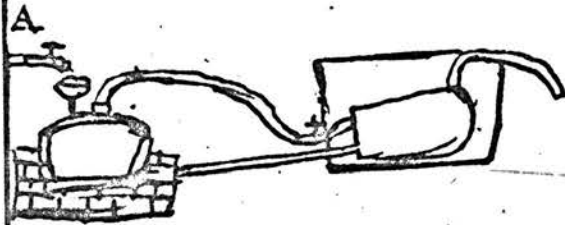






The improvements I noted were
1st heating the Vats by Steam
a Boiler of cast iron with a Top
well secured & secured down is fixed
on any convenient part of the Mill
& from thence a feeder pipe
carries the Steam thro the Mill
— from this pipe small ones lead
to each Vat, into a copper pot
similar to a fire pot — from the
bottom of this pot another pipe
is carried to the bottom of the
boiler to convey the water ar-
riving from any Steam that is
condensed — a cock is fixed to the
pipe conveying the Steam which
the Vatman turns at pleasure
& another pipe leading from the
opposite end of the Pot over the
top of the Vats carries off the over

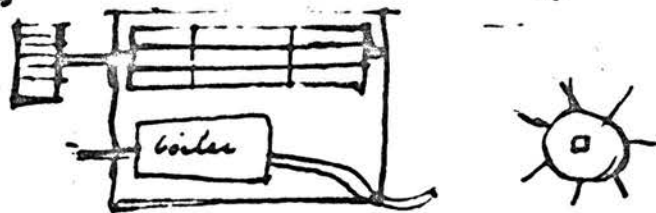
the steam — the water also for
working Belts & other purposes
is heated in same mode — the
Watt boiler appears thus.



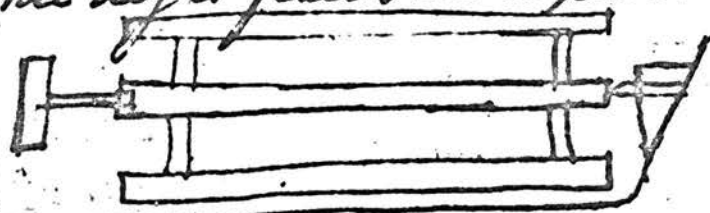
a small cock supplies the boiler
with fresh water as at A. A hole
is left in the top of it to throw off
the superabundant steam —

2^d Improvement is a key or turn
all

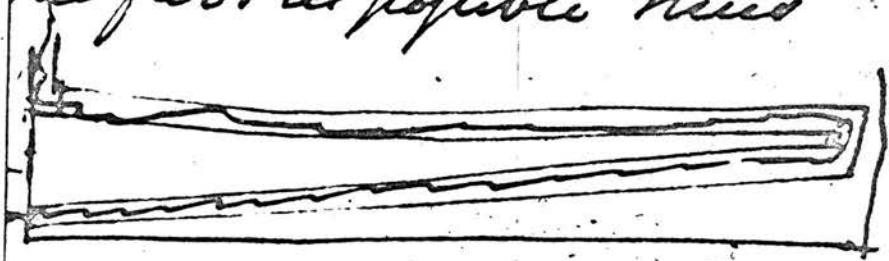
made to turn in the stuff chest
to keep the stuff constantly up
this done by throwing water
on a very small wheel which
turns the barrels or hay as
thus



the hay is taken out or put in
at any time for use as occasion
may require it is turned by a
square iron pin fixed on the end of
the axle of the small wheel which
which goes into a square in the end
of the axle of the hay. the other end
of the hay is fixed in a pivot thus



3^d Improvement is in carrying
a flue round the drying room for
the purpose of drying the paper
in wet or cold weather most
& the Mills have a room for
this purpose separate from
the drying Loft as the flues
come up so high as not to be
in enough heat the Windows
which I find they place as near
the floor as possible thus



In all the drying rooms at the
Mills the Windows are at the
bottom of the floor & the area
to the Roof quite open as shown

being laid above the square
the whitening the coarse Rays
This improvement was first
adopted by W. Simpson from
Herr's translation of Whittholts
specy on bleaching W.S. after
a number of experiments
adopts the following mode
the coarse Rays are first put
in the beating engine for 2 hours
then carried into a large boiler
where they are boiled in a
strong alkali of lime of potash
pearl ash or even in lime water
itself - after being thus boiled
they are taken out & put in
a square box of cast iron

with small holes where they
are pressed with a screw till
dry, when dry they are pressed
to pieces by women & put into
square boxes made very
tight & tight of the wing of an
engine - these boxes have a
cover fitting close which of
the the Russ are in must be
made very tight by putting
paper at every crevice where
the air can possibly escape
- a small furnace is built
between two of these boxes
- on the top of this furnace
is fixed a square cast iron
boiler in which is placed a

loaden retort to the
boiler fastens down, the
boiler is then filled with
water just to work in the
retort then place 16^{lb} of oil
Vitriol 8^{lb} of nassalt & 8^{lb}
of manganese which will
form a gas which passes
from the top of the retort
thru a pipe to the top of the
box thru which it passes
saturates the whole
mass of Rays. the above
quantity is sufficient for
3000 Rays. or 800 Rays. after
they are left thus for 6 hours
they are taken off they de-

gives the yellow color which
at first appears at top well
so off the Rays are then put
into the beating engine. These
beaters tell fit for use & very
ab. hues. — Mr. Simpson
of late has omitted washing
them in alkali from the
pne but it is of great use
not only in destroying
the bad color but in softening
the Shewies or particles of
them — Reports of such the wife
do of a less experience for more
simple kind than Lead.
some of the kind are made
in London by —

- the paper to convey y^e Sur
to the boxes must be
more than 1/2 or an inch
more of the Lead putty thick.
- the mixture and stuff for
spirits of Sea Salt will do
better than oil of vitriol y^e
Decay cupric. Or of these
spirits y^e Or of manganese
must be added.

5th Improvement in stabilizing
Smalts for Indigo - 2th of best
F.F.E. Smalts is sufficient for
in cupric. will never blue spot
gives a much better color
- the under side of the paper
ill always in this mode

appear the bestowing to
the finally being a heavy
body keeping in the mold
of this side sheets always
in place up to the point; the
color of paper is much more
even when done in this
way —

Copper Spouts of about 1/2 inch
diameter are used to convey
the stuff into of Cuts from
of Engine —

The names of W. Piteau and
Remain of Alex. Brown

The molds are placed in
trap gates the first

it slides over the valves —

No ball covers are used —

All sewers are of cast iron
and from London, the works
here are ~~badly~~ ~~badly~~ of
do not cast them well —

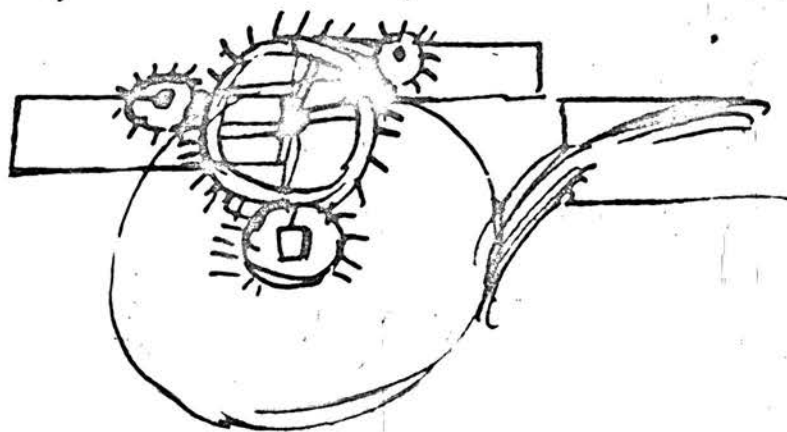
but the pipes, & bores, & tubes
you are had of.

founder Lenth walk —

— They work with water
pumped up from the head
of at the last with. Spring
or pump water also pumped
up — neither of these Mills
have a high spring down
very water & water, in fact

the Mill —

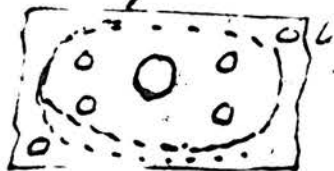
The Rye is much the same as ours. only turned differently viz by a perfect double instead of a horizontal fly wheel thus.



- Went to Mr. Scotts, plumber
makes y^e vents for Simpson
Lead at? is with thick - beat
out & solid - of this shape



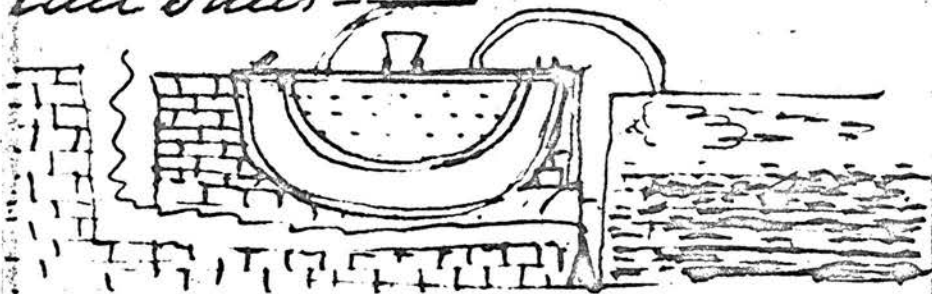
Top of Lead also soldered on
with a hole in y^e middle
~~for~~ to put in the Vitriol
jar - this the stop with a
wooden plug - holes for the
pipe conductors, one valve
another to put in water
thus



he informs me that by being
careful to keep the surface
of the stuff at different heights
by putting in a greater or

less quantity of wt. — or greater
or less of water is in. I have
the boiling course some
times lower sometimes higher
it will last many years
— cost of one abt. 8¹/₂ £ guineas
— casts his leaden pipes in
2 feet lengths — price abt.
14¹/₂ pence for 3 in bore
— after breakfast went to
Booper & Bauhens foundry
Leeds walk — saw them casting
bullets in iron moulds: which
on being knocked off open
forcibly breaks y. knock off
— they make all kinds of
flatware but no hollow ex-
cept large boilers for — spoke
abt. a large boiler — retort — square

box for printing Rags - Mill
machinery & any pattern -
get their general prices - their
agents in London are Hood
Earl Street -



Called on Robert Brunton at
Carron where have the
consignees of the - Ship Bar
rington - belonging to
Robert Atten of New York
- informs me that - he ships
Porter - coals - bottles - window
glass - sail cloth - the remainder
of which give me prices - he
sells Potash - staves &c -

oak timber - flax seed -
of all which got prices - asks
£5.4 per ton for iron ware -
- a manufacture of oil of
vitriol is carried on here by
- reported at 4 1/2 a
- A. 6 mos credit -

18

after thus describing what has been published on the subject, I shall mention what I have seen carried into effect in Russia.

9

The first opportunity I had of observing the bleaching process was at the Mills of M'Lincoln near Polton bank, in the vale of Ayrshire near Edinburgh. This gentleman in a handsome manner commenced to show me all his process: I found him applying the Gas immediately to the Rags. His furnace was of simple brick in one of the outer rooms of his mill; I believe he runs the Rags thro' the working Engine before he submitted them to the Gas, he also boiled them in ^{water} ~~lees~~, & this he proposed as highly useful not only to the bleaching but to detaching the hard remains of flax in the coarse linnen which ^{were} ~~are~~ the chief objects of ^{his} attempts. — I think his retorts were of Lead, & the Gas conducted into troughs of Deal of ab. 11 feet long, 4 wide & 3 deep in which the Rags were inclosed. — I do not think he had adopted any mode for preventing the effects of the Gas on the workmen, but opening the door & letting the Gas go off when the boxes were opened before the Rags were taken out. I may not be correct in mentioning this circumstance

W Simpson carried on the bleaching process & great extent it was also adopted by other Paper makers in the same vale — I am not well informed W.S. has since failed & his failure in some degree attributed to the bleaching process, of this however I am not correctly informed.

20

at Glasgow, I saw no application of the bleaching process to Rags, but I found the cotton juncos Manufacturers, making juncos the bleaching liquor — they appeared to follow Beckett's method, indeed Mr Tate at Glasgow was one of the first persons who adopted juncos and the art into England. — I found the Messrs Robison & Son, large number manufacturers making the bleaching liquor in retorts fixed in a high cupell furnace of iron — on conversing with Mr R, I thought he did not very highly approve of the mode perhaps from attachment to the old method which he also pursued — he seemed to think it too expensive for Rags, recommended bleaching them by spreading on the Grass juncos lime, alkali sea.

DATE	2nd Crown (reams)	2nd Fscp. (reams)	2nd Demy (reams)	2nd Pott (reams)	Large Brown Cap. (reams)	Small ord. ⁿ Brown (rns.)	Whited Brown (Bundles)	Pasteboard (cwts)	Painted Paper (sq. yfs)	Ad Valorem (declared value in £)	Duty (£)
1713	2156	1	-	1517	-	203	997	221	1313	79	195
14	1460	17	-	1815	-	219	775	110	720	98	156
1715	1053	-	-	1296	-	105	651	38	124	121	155
16	837	-	-	1091	-	167	465	50	-	76	135
17	538	-	-	1066	-	112	454	48	-	25	107
18	218	-	28	1109	59	171	478	47	-	52	100
19	133	-	-	1059	20	115	505	62	-	69	96
1720	532	-	-	797	42	82	498	34	-	39	97
1	341	-	-	925	40	88	426	40	511	25	91
2	192	-	-	922	33	6	493	37	1439	36	89
3	57	-	-	1005	89	48	308	26	3632	33	92
4	128	-	-	914	76	16	717	47	4336	74	123
1725	113	-	-	783	30	-	554	46	1064	60	85
6	65	8	-	330	-	-	1151	40	295	58	81
7	12	334	-	236	-	-	1367	20	66	217	125
8	109	3	-	240	-	-	819	12	667	211	91
9	-	14	16	324	-	-	805	11	756	472	136
1730	88	46	-	264	-	-	941	27	725	375	131
1	37	48	-	123	-	-	985	37	1024	439	140
2	39	47	-	222	59	103	1254	95	1173	766	231
3	16	36	-	19	-	70	1524	74	578	666	203
4	-	8	-	7	-	132	1375	45	671	773	210
1735	21	5	-	5	10	105	1485	75	758	662	201
6	28	-	-	13	-	166	1182	59	472	602	175

Quantities of paper and board charged and duty
for the years 1713 - 1736.

Determination of mean price of paper sworn for
"ad valorem" taxation

In determining a mean price per ream for the paper declared under the ad valorem heading, two methods were used.

(a) The numbers of reams excised each year from 1781 to 1791 were listed and the mean annual increase calculated. This came to 8,341 reams. This was then subtracted from the 1781 figure, leaving 23,289 reams, which was taken for 1780. From this the declared reams for 1780 (i.e. 12,380) were subtracted, leaving 10,909 reams for the unknown quantity declared for ad valorem. The sworn value was £2,394 from which the price per ream came to $4/4\frac{1}{2}$ per ream.

(b) The mean difference obtained above (8,341) was expressed as a percentage of the 1781 figure of 31,630. This was 26.37%. Using this for the 1780-1781 change gave 25,024 reams for 1780. Subtracting the declared reams for 1780 (12,380) gave 12,644 reams for the ad valorem. The quantity was sworn at £2,394, from which the price per ream was $3/9\frac{1}{2}$.

The mean of (a) and (b) was $4/1$ per ream and due to the approximations of the method, the penny is not significant and the figure of $4/-$ per ream was taken.

THE ACTS RELATING TO EXCISE DUTIES ON PAPER

1711	10 Anne C.19	Duties on 11 enumerated kinds of paper. Registration of premises and makers. Extra on printed paper.
1713	12 Anne C. 9	Addition of 50% to all duties.
1714	1 Geo. I Stat. 2 C.36	Printed Paper - more regulations.
1779	19 Geo. III. C.25	Addition of 5%
1781	21 Geo. III. C.17	Addition of 5%
1781	21 Geo. III. C.24	Five tables of sorts of paper to be parcelled in reams or bundles only. Drawback on loss at sea.
1782	22 Geo. III. C.66	Addition of 5%
1784	24 Geo. III C.18	Additional duties in five tables.
1784	24 Geo. III C.41	Paper makers and stainers to take £2 licence.
1786	26 Geo. III C.78	Painted paper - 2 weeks to pay instead of 6. Stamping regulations tightened up.
1787	27 Geo. III C.13	Increases in excise duties.
1787	27 Geo. III C.31	Changes in classifications.
1794/		

2.

1794	34 Geo. III C.20	All paper charged by weight. Parcelling regulations - excised paper not to leave mill for 2 days. Watermark mentioned.
1801	A1 Geo. III C.8	Duties (except glazed paper) doubled. Stained paper to be of the 1st class.
1802	A2 Geo. III C.94	Two classes of paper only.
1803	A3 Geo. III C.69	Elimination of Sheathing and Button paper.
1807	A7 Geo. III S.2. C.30	Sheathing and Button again taxed. Penalty for counterfeiting stamps, transportation,
1809	A9 Geo. III C.81	Transportation the penalty for an offence.
1815	55 Geo. III C.30	Licence fee raised to £4.
1816	56 Geo. III C.103	Daily output return to be kept. Regulations on parcelling and stationer's business within 2 miles of a mill.
1819	59 Geo. III C.90	Increase of penalty for tampering with books of returns of output.
1820	1 Geo. IV C.58	Change of record of output to take account of machines. Regulations on parcelling. Penalty, for forgery, of £1000. Licences by makers of tea trays, spectacle cases, etc.,
1825	6 Geo. IV C.81	Sign to be erected.
1834/		

3.

1834	4a, 5 Wm. IV C.77	Freeing from excise of Scaleboard made of wood.
1836	6 & 7 Wm. IV C.52	Simplification to one class and duty.
1840	3 Vic. C	Addition of 5%.
1861	24 Vic. C.20	Repeal of all excise duties but not of licences.

LIST OF PAPER MILLS IN SCOTLAND 1825

1.	Thos. McCornish	New Mill, Grief
2.	Alex. Ferguson	Auchterarder
3.	Gregor Murray	Milton Bay, Auchterarder
4.	John Campbell	Damside, Auchterarder
5.	Wm. Robertson	New Calder
6.	James Hogg	Buchsburn
7.	(Alex. Pirie)	(Stoneywood)
8.	Chas. Smith & Co.	Stoneywood
9.	Wm. Stewart & Co.	Culter
10.	(Robert Tullis)	(Auchmuty)
11.	John Johnson	Adam Brae (Midcalder)
12.	Henry Lindsay (? John)	Woodend, Methven
13.	(David Lindsay)	(Roths)
14.	Janet Grieve	Balbirnie
15.	Robert Laing	W. Saltoun
16.	Geo. Gourlay	Leith Head
17.	Wm. Finnie & Co.	Galston
18.	Duncan Campbell & Co.	Millholm, Cathcart
19.	Archd. Muir & Co.	Cart Mill, Cathcart
20.	(Jas. Craig)	(Newbattle)
21.	E. Collins	Dalmuir
22.	Jas. Watson	Duntocher
23.	Jas. Brown	Esk
24.	Wm. Cadell & Co.	Auchendinny
25.	A. Cowan & Sons	Melville
26.	(Hugh Crichton)	(St. Leonardo)
27.	(A. Cowan & Sons)	(Low, Pennycuik)
28.	Alex. Annandale	Polton
29.	(John Cameron)	(Springfield)
30.	Kilgour & Paterson	Loch
31.	Adam Mansen & Co.	Blackburn
32.	John Gray	New Mill, West Calder
33.		
34.	Young Trotter & Co.	Broomhouse
35.	Peter Rintour	Allanbank
36.	/	

36.	Ebenezer Martin	Millbank Ayton
37.	Russell and McArthur	Dalsholm
38.	Jas. McRobie	Airthrey
39.	(Robert Weir)	(Herbertshire)
40.	Jas. McRobie	Airthrey No. 1
41.	Thos. Burns	Garvel, Stirling (or Burns & Muirhead)
42.		
43.	John Ferguson	Dunblane
44.	Robert McRobie	Keir, Stirling
45.	Alex. Wilson	Dalbeattie, Mount Pleasant
46.	Jas. Houston	Dalbeattie
47.	Douglas Kirkpatrick & Co.	Colzer, Dumfries
48.	(Wm. Thomas Jnr.)	(Tongland)
49.	Walter Miller	Patrickbank, Paisley
50.	Robert Walker	Balerno Bank
51.	John Logan	Byrnie
52.	Kilgour & Paterson	Balerno
53.	Roberts & Crawford	Kenleith
54.	John Milne	Woodhall
55.	John Smiles	West, Colinton
56.	(Balfour & Co.)	(Kate's)
57.	Wm. Cadell & Sons	Peggy's, Cramond
58.	Archd. McGowan	Netherlee, Cathcart
59.	Wm. Blackie	Townhead, Balerno
60.	A. Cowan & Sons	Valleyfield
61.	Joseph Crawford	- (Linlithgow Coll.)

Compiled from Gillis' articles W.P.T.R. 1912-14)
quoted from a manuscript list at Cowans but not found there.

Items in brackets not found in W.P.T.R.

PAPER MILLS IN SCOTLAND,

MAKERS' NAMES,

Number of Machines, Vatts, and Denomination of Papers made at each.

Of those left blank a number are converted to other purposes, and the remainder are (from various causes) at present silent.

Number of the Mill.	Maker's Name.	Name of the Mill.	Where situated.	Num. of Machines.	Vatts.	Denomination of Papers made at each Mill.	Places of Business, Residence, &c.
1	James Taylor	New Mills	Orkney, Perthshire	0	1	Brown and Grey	Resides at the Mill.
2							
3							
4							
5	William Robertson	New Calder	New Calder, by Linlithgow	0	1	Brown and Grey	Resides at the Mill.
6							
7	Alexander Pirrie	Stoneywood	Stoneywood, by Aberdeen	2	0	Printing, &c.	Warehouse, Adelphi Court, Aberdeen, resides at Mill, in town daily.
8	Charles Smith & Co.	Stoneywood	Stoneywood, by Aberdeen	0	3	Printing and Writing	Do. St Andrew S', do. do. in town on Fridays.
9	Alex. Irvine & Co.	Coulter	Coulter, by Aberdeen	2	0	Cartridge, Grey, and Brown	Do. Marischal S', do. do. in town daily.
10	Robert Tullis & Co.	Auchmuty	Auchmuty, by Kirkcaldy	1	0	Writing, Printing, and Cartridge	Resides at the Mill.
11							
12	John Lindsay & Co.	Woodend	Woodend, Perthshire	0	4	Writing and Printing	Resides at the Mill.
13							
14	Janet Grieve	Balbirnie	Balbirnie, Fyfeshire	0	2	Cartridge and Grey	Resides at the Mill.
15							
16	Andrew Gourley	Leith-head	Leith-head, by Linlithgow	0	1	Tea and Grey	Resides at the Mill.
17	Alexander Finnie	Strath Mill	Galston, by Kilmarnock	0	1	Brown and Grey	Resides in Kilmarnock, Ayrshire.
18	John Webster	Millholm	Cathcart, by Glasgow	0	3	Writing Posts, Foolscaps, and Potts	Warehouse, Wilson's Court, Argyle Street, Glasgow.
19	Robert Weir	Cathcart	Cathcart, by Glasgow	0	2	Mill boards, Pressings, and Brown	Warehouse and Residence, 12, Miller S', Glasgow.
20	James Craig	Newbattle	Newbattle, by Dalkeith	1	0	Printing and Coloured	Resides at the Mill.
21	Edward Collins	Dalmuir	Dalmuir, Dumbartonshire	2	4	Superf. & 2d Writing, Printing, Music, Plate, Drawing, Blotting and Coloured.	Warehouse, 48, Virginia S', Glasgow, resides at Mill, in town Mondays, Wednesdays and Fridays.
22							
23							
24	Phillip Caddell & Co.	Auchindenny	Auchindenny, by Dalkeith	1	0	Writing and Printing	Warehouse, Royal Exchange, Edinburgh.
25							
26	William Brookes	Saint Leonards	Lasswade, by Edinburgh	1	0	Writing and Printing	Resides at the Mill.
27	Alex. Cowan & Son	Pennyquick	Pennyquick, by Edinburgh	1	0	News and other Printing sorts	Warch. 17, Princes S', Edin.—residences, A. Cowan, Merry house, Edinburgh, C. Cowan, Valleyfield, Pennyquick.
28	Alex. Annandale & Son	Polton Mill	Polton, by Dalkeith	1	1	Writing and Printing	Resides at the Mill.
29	John Cameron & Co.	Springfield	Springfield, by Dalkeith	1	1	Printing, and Mill Boards	Warehouse, Adam's Square, Edinburgh.
30	Thomas Kilgour, jun.	Loch Mill	Linlithgow	0	2	Writing and Printing	Resides at the Mill.
31	James Brown & Co.	Esk Mill	Pennyquick, by Edinburgh	2	0	Writing and Printing	Wh. 9 Blair S', Edin. reside at mill, in town on Tuesd.
32	Robert Crawford	New Mill	Linlithgowshire	0	1	Brown and Grey	Resides at the Mill.
33	Alex. Cowan & Co.	Bank Mill	Pennyquick, by Edinburgh	0	2	Superfine and Second Laid Writing	See Mill No. 27.
34	Young, Trotter & Son	Broomhouse	Broomhouse, by Dunse	1	3	Chiefly News and other Printing sorts	Resides at the Mill.
35	William Martin	Allan Bank	Churnside, by Dunse	0	2	Binders' boards and Pressings	Resides at the Mill.
36	Ebenezer Martin	Mill Bank	Ayton, Berwickshire	1	0	Coloured, Cartridge, Brown & Pressings	Resides at the Mill.
37	James M'Arthur	Dalsholm	Dalsholm, by Glasgow	0	3	Callenders, Brown, &c.	Warehouse, 72 Glassford S', Glasgow, resides at Mill, in town Tuesdays, Wednesdays and Fridays.
38	James M'Robie	Airthrey 2d.	Bridge of Allan, Stirling	0	2	Brown and Grey	Resides at the Mill.
39	Robert Weir	Denny, Stirlingshire	Denny, Stirlingshire	0	2	Superf. & 2d Posts, Foolscaps & Potts	Warehouse and Residence, 12, Miller S', Glasgow.
40							
41	Gavin Glennie	Carron Grove	Denny, Stirlingshire	0	1	Writing, Cartridge, and Coloured	Resides at the Mill.
42	John Muirhead	Garvald	Garvald, Stirlingshire	0	2	Brown and Grey	Resides at the Mill.
43							
44							
45	Elizabeth Wilson	Dalbettie	Castle Douglas, Dumfries	1	0	Brown and Grey	Resides at the Mill.
46	William Lewis	Dalbettie	Castle Douglas, Dumfries	0	2	Brown and Grey	Resides at the Mill.
47							
48	William Henderson	Grange	West Calder, near Linlithgow	0	1	Brown and Grey	Resides at the Mill.
49							
50	Alex. Walker & Co.	Balerno Bank	Balerno, by Edinburgh	1	1	Tea and Grey	Resides at the Mill.
51	Helen Logan	Balerno	Balerno, by Edinburgh	0	1	Tea and Grey	Resides at the Mill.
52	George Laing & Co.	Balerno Mill	Balerno, by Edinburgh	2	2	Brown, Cartridge, & Binders' Boards	Resides at the Mill.
53	Russell, Kerr & Co.	Kinleith	Kinleith, by Edinburgh	1	0	Printing, Brown, and Coloured	Resides at the Mill.
54	John Milne	Woodhall	Juniper Green, by Edinburgh	0	2	Superfine 2d & 3d Writing, Printing, Blue, Blotting, Cartridge, Tea and Grey.	Resides at the Mill, in Edinburgh on Wednesdays.
55							
56	Alex. Cowan & Son	Kates Mill	Collington, by Edinburgh	1	0	Printing,	See Mill No 27.
57	Phillip Caddell	Cramond	Cramond, by Edinburgh	0	2	Cartridge, and Coloured	See Mill No. 24.
58	Archibald M'Gown	Netherlee	Cathcart, by Glasgow	0	3	Writing Posts, Foolscaps, and Potts	Wh. Stockwell Pl. Glas. resides at mill, in town daily
59							
60	Alex. Cowan & Co.	Valleyfield	Pennyquick, by Edinburgh	2	0	Superf. and 2d Writing and Printing	See Mill No. 27.
61	James Bain	Balerno	Balerno, by Edinburgh	0	1	Tea and Grey	Resides at the Mill.
62	John Craig	Moffat Mill	Airdrie, by Glasgow	0	3	Millboards, pressings, brown, tea & grey	Warehouse, 19 Bell street, Glasgow, resides at Mill.
63	Thomas Jaffray	Waterton	Waterton, by Aberdeen	0	1	Tea and Grey	Resides at the Mill, in Aberdeen on Fridays.
64	John & Andrew Young	Jellyholm	Allon, Stirlingshire	0	1	Tea, Grey, and Purple	Resides at the Mill.
65							
66	Charles Davidson	Muggie Moss	Muggie Moss, by Aberdeen	1	0	Brown and Grey	Resides at the Mill, in Aberdeen on Fridays
67	John Luke & Son	Crook of Devon	Crook of Devon, Dunfermline	0	1	Tea and Grey	Resides at the Mill.
68	David Muir & Co.	Clarkston	Airdrie, by Glasgow	0	2	Millboards, pressing, brown, tea, & grey	Resides at the Mill.
69	Edward Collins	Dalmuir	Dalmuir, Dumbartonshire	1	0	Brown, grey, cartridge, calender & cold	See Mill No. 21.
70	Malcom Muir & Co.	Hutchesontown	Glasgow	0	0	Hatters' Boards	
71	James M'Robie	Bridge of Allan, Stirling	Bridge of Allan, Stirling	1	0	Brown and Grey	See Mill No. 38.
72	James Watson	Townhead	Kilsyth, Stirlingshire	1	0	Brown and Grey	Resides at the Mill, in Glasgow on Wednesdays.
73	James Walkinshaw	Overton	Overton, by Greenock	2	0	Cartridge linings, Demy Blue & Brown	Wareh. 107, Ingram st. Glasgow, resides at the Mill, in Glasgow 4 times a-week.
74							
75	James Smitton	Nethercoul	Auchterarder, Perthshire	0	1	Brown, Tea, Grey, and Blues	Resides at Mill, in Perth at Thos. Menzies, County Place, on Fridays.
76	John & William Kay	Saughton Mill	Slateford, by Edinburgh	0	0	Donnet, Hosiers, Lace and Card board	Reside at the Mill.

PUBLISHED BY OLIVER & BOYD, EDINBURGH AND ROBERT WEIR, MILLER STREET, GLASGOW.—April, 1832.

MACLURE, PRINTER, GLASGOW.

LIST OF PAPER MILLS IN SCOTLAND 1852

No.	Maker	Mill	Where situated
5	Adam Robertson	New Calder	Mid-Cadler
6	Robert Craig	Caldercruix	Airdrie
7	Alex. Pirie and Sons	Stoneywood	Aberdeen
9	Arbuthnot & M'Combie	Coulter	Aberdeen
10	R. Tullis and Co.	Auchmuty	Markinch
11	Wm. Innes and Co.	Levenbank	Leslie
12	Bullionfield Paper Co.	Bullionfield	Dundee
13	R. Tullis and Co.	Roths	Markinch
14	Janet Grieve and Co.	Balbirnie	Markinch
15	John Hill and Co.	Balerno Bank Mill	Edinburgh
17	John Mackintosh	Strath Mill, Galston	Kilmarnock
18	R. and J. Couper	Millholm, Cathcart	Glasgow
19	S. Lindsay	Cathcart	Glasgow
20	Robert Craig and Co.	Newbattle	Dalkeith
21	Edward Collins and Son	Dalmuir	Dumbartonshire
23	Archibald Somerville	Kevoek Mill	Lasswade
25	Wm. Somerville & Son	Dalmore	Pennicuik X
26	William Tod, Jun.	St Leonards	Lasswade
27	Alex. Cowan and Sons	Low Mill	Pennicuik
28	Alex. Annandale & Son	Polton Mill	Lasswade
29	Cameron & Co.	Springfield	Loanhead
30	Scott and Drennan	Loch Mill	Linlithgow
31	James Brown and Co.	Esk Mill	Pennicuik
32	John Milne	New Mill	West Calder
33	Alex. Cowan and Sons	Bank Mill	Pennicuik
36	Innes and Martin	Millbank	Ayton, Berwickshire
37	James M'Arthur & Co.	Dalsholm	Glasgow
38	H. Henderson and Co.	Airthrey	Bridge of Allan, Stirling
39	A. Duncan and Sons	Herbertshire	Denny
41	John Macrobie	Carron Grove	Denny
45	William Lewis	Dalbeattie	Castledouglas
48	Christian Robertson	Grange Mill	Mid-Calder
51	John Hill and Co.	Balerno	Currie
52	James Durham	Balerno Mill	do.
53	Henry Bruce	Kenleith	do.
54	Robert Martin	Woodhall	Juniper Green, Colinton

No.	Maker	Mill	Where situated
55	Richard Wallace	West Mill	Colinton, Edinburgh
56	D. Chalmers and Co.	Kate's Mill	Slateford, Edinburgh
57	William Cadell and Co.	Cramond	Edinburgh
59	Innes and Martin	Bleachfield	Ayton, Berwickshire
60	Alex. Cowan and Sons	Valleyfield	Pennicuik
61	Young Trotter and Son	Chirnside Bridge	Chirnside, Berwickshire
62	John Craig, Junior	Moffat Mill	Airdrie
63	William Davidson	Waterton	Aberdeen
65	Daniel Ferguson	Mossie Mill	Colinton, , Edinburgh
66	William Davidson	Muggie Moss	Aberdeen
67	John Luke	Crook of Devon	Kinross
72		Townhead	Kilsyth, Stirlingshire
73	James Gray and Co.	Overton	Greenock
77	David Craig and Co.	Portobello	Edinburgh
78	D.H. Lusk	Woodside	Glasgow
79	Edward Collins & Son	Kelvindale	Glasgow
	Oswald Guthrie & Co.		Brechin

Thornton and Collie's list 1852

Printed and sold by Thornton and Collie, 19 St. David Street
(price five shillings)

LIST OF PAPER MILLS IN SCOTLAND 1853

No.	Maker	Mill	Where situated
5	Adam Robertson	New Calder	Mid-Calder
6	Robert Craig	Caldercruix	Airdrie
7	Alex. Pirie & Sons	Stonywood	Aberdeen
9	Arbuthnot & McCombie	Coulter	Aberdeen
10	R. Tullis & Co.	Auchmuty	Markinch
11	Wm. Innes & Co.	Levenbank	Leslie
12	Bullionfield Paper Co.	Bullionfield	Dundee
13	R. Tullis & Co.	Roths	Markinch
14	Janet Grieve & Co.	Balbirnie	Markinch
15	John Hill & Co.	Balerno Bank Mills	Edinburgh
17	John Mackintosh	Strath Mill, Galston	Kilmarnock
18	R. & J. Couper	Millholm, Cathcart	Glasgow
20	Robert Craig & Co.	Newbattle	Dalkeith
21	Ed. Collins & Son	Dalmuir	Dumbartonshire
23	Archd. Somerville	Kevoek Mill	Lasswade
25	W. Somerville & Son	Dalmore	Pennicuik
26	William Tod, Jun.	St. Leonards	Lasswade
27	Alex. Cowan & Sons	Low Mill	Pennicuik
28	A. Annandale & Son	Polton Mill	Lasswade
29	Cameron & Co. (Durham & Son)	Springfield	Loanhead
30	Scott & (Drennan) (A. Cowan & Sons)	Lock Mill	Linlithgow
31	James Brown & Co.	Esk Mill	Pennicuik
32	John Milne	New Mill	West Calder
33	A. Cowan & Sons	Bank Mill	Pennicuik
36	Innes & Martin	Millbank	Ayton, Ber'shire
37	J. McArthur & Co.	Dalsholm	Glasgow
38	H. Henderson & Co.	Airthrey	Bridge of Allan, Stirling
39	A. Duncan & Sons	Herbertshire	Denny
41	John Macrobie	Carron Grove	Denny
45	William Lewis	Dalbeattie	Castledouglas
48	Christian Robertson	Grange Mill	Mid-Calder
51	John Hill & Co.	Balerno	Currie
52	James Durham	Balerno Mill	do.
53	Henry Bruce	Kenleith	do.
54	Robert Martin	Woodhall	Juniper Green, Colinton

No.	Maker	Mill	Where situated
55	Richard Wallace	West Mill	Colinton, Edinburgh
56	D. Chalmers & Co.	Kate's Mill	Slateford, Edinbro'
57	Wm. Cadell & Co	Cramond	Edinburgh
59	Innes & Martin	Bleachfield	Ayton, Ber'shire
60	A. Cowan & Sons	Valleyfield	Pennicuik
61	Young, Trotter & Son	Chirnside Bridge	Chirnside, Ber'sh
62	John Craig, Junior	Moffat Mill	Airdrie
63	William Davidson	Waterton	Aberdeen
65	Daniel Ferguson	Mossie Mill	Colinton, Edinbro'
66	William Davidson	Muggie Moss	Aberdeen
67	John Luke	Crook of Devon	Kinross
72		Townhead	Kilsyth, Stirl'shire
73	James Gray & Co.	Overton	Greenock
77	David Craig & Co.	Portobello	Edinburgh
78	D.H. Lusk	Woodside	Glasgow
79	Ed. Collins & Son	Kelvindale	Glasgow

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Bradshaws list 1853

Published R. J. Bradshaw Church Row Aldgate (one shilling)
(Items in brackets are manuscript additions by James Town
5th March 1858).

LIST OF PAPER MILLS IN SCOTLAND 1860.

1.	Smith and McLaurin	Port Dundas, Glasgow
3.	Stewart and Brown	Glasgow Paper Mills, McNeil Street, Govenhaugh
4.	Oswalds, Guthries and Craig	Brechin
5.	Adam Robertson	New Calder, Mid Calder
6.	R. Craig	Caldercruix by Airdrie
7.	Alex. Pirie & Sons	Stoneywood, Aberdeen
9.	Alex. Pirie & Sons	Culter
10.	R. Tullis & Co.	Auchmuty, Markinch, Fife
12.	D.M. Watson	Bullionfield, Dundee
13.	R. Tullis & Co.	Roths
14.	Janet Grieve & Co.	Balbirnie
15.	Hill Craig & Co.	Balerno Bank
17.	Mrs. Macintosh	Strathmill, Galston
18.	R. & J. Couper	Millholm, Cathcart
19.	Solomon Lindsay	Cathcart Paper Mill
20.	Robert Craig & Co.	Newbattle
21.	E. Collins and Son	Dalmuir, Cumbartonshire
23.	Ad. Morton Sommerville	Kevoek, Lasswade
25.	Wm. Sommerville & Son	Dalmore, Milton Bridge, Edinburgh
26.	Wm. Tod & Sons	St. Leonards, Lasswade
27.	Clyde Paper Co.	Clyde, Eastfield, Rutherglen;
28.	Alex. Annandale & Son	Polton, Lasswade
29.	Jas. Durham & Sons	Springfield, Loanhead
30.	Scott and Drennan	Loch Linlithgow
31.	Jas. Brown	Esk Pennycuik
32.	John Milne	New Mill, West Calder
33.	Cowan & Sons	Bank, Pennycuik
34.	Daniel Ferguson	Westfield, Torphichen
35.	Loch Mill Paper Co. (Thos. Chalmers)	Loch Mill, Linlithgow
36.	Wm. Martin	Millbank, Ayton
37.	Jas. McArthur & Co.	Dalsholm
38.	Robert Philp	Airthrey, Bridge of Allan, Stirling
39.	Alex. Duncan & Sons	Herbertshire
41.	Robert Weir	Carrongrove
45/		

2.

45.	Wm. Lewis	Dalbeattie
51.	Hill Craig & Co.	Balerno Bank
52.	Jas. Durham & Sons	Balerno Mills
53.	Henry Bruce	Kenleith
54.	J.H. Bailey	Woodhall
55.	H. Bruce	West Colinton
56.	D. Chalmers & Co.	Kate's
57.	A. Cadell	Peggy's
59.	Wm. Martin	Bleachfield
60.	A. Cowan & Sons	Valleyfield
61.	Young Trotter & Son	Chirnside Bridge
62.	John Craig & Co.	Moffat, Airdrie
63.	Chas. Davidson & Son	Waterton
65.	Andrew Scott	Mossy, Colinton
66.	C. Davidson & Son	Mugiemoss
67.	John Luke	Crook of Devon, by Kinross
73.	Brown, Stewart & Co.	Overton
77.	David Craig & Co.	Portobello
78.	Robert Bruce	Woodside, Glasgow
79.	Ed. Collins & Sons	Kelvindale

(Compiled by the editor, and reprinted from
The Stationer, London 1860.)

Alphabetical List of Mills in Scotland up to
1861

A	Adam Brae (W. Calder)	1825	
	Airthrey 1 (No. 40)	1803	
	Airthrey 2 (No. 38)	1825	
	Airthrey 3	1832	
	Allanbank (Ednam)	1825	
	Auchendinny	1756	
	Auchmuty	1810	
	Auchterarder	1825	
	Auchterarder (Daviside)	1812	
	Auchterarder (Milton Bay)	1825	
	Auchterarder (Nethercoul)	1832	
	Avon	1860	
	Ayton (Bleachfield)	1842	
	Ayton (Gray Paper Mill)	c 1693	
	Ayton (Millbank)	1790	
B	Balbirnie	1816	
	Balerno	1810	
	Balerno (?)	c 1832	
	Balerno Bank (New)	c 1825	
	Balerno Bank (Old)	c 1825	
	Balgray No. 1 (Collins)	1746	
	Balgray No. 2 (Duncan)	1790	
	Bank (Pennycuik)	1803	
		1795	
	Blackburn (Linlithgow)	1820	
	* Bleachfield (Ayton)	1842	
	Bogs Mill (Colinton)	1717	
	Bowling (Milton's)	1852	
	Braid	1695	
	Brechin	1851	
	Broomhouse (Duns)	c 1760	
	Bucksburn No. 1 (Aberdeen)	1309	
	Bucksburn No. 2	1810	or 11
	Bullionfield (Dundee)	1850	
	Byrnie (Balerno)	1799	

2.

C	Caldercruix	1848
	Canonmills No. 1	1652
	Canonmills No. 2	1682
	Carriden (Linlithgow)	c 1842
	Carrongrove	1828 or 9
	Cartside (Milliken Park)	1850
	Cathcart	c 1682
	Cathcart Millholm	1716
	Cathcart Netherlee	1818
	Chirnside	1842
	Clarkston (Airdrie)	1832
	Clyde (Rutherglen)	1856
	Colinton (West)	1825
	Colzer (Dumfries)	1825
	Craigbeg Ferryhill (Aberdeen)	
	(Devonha)	1803
	Craigmarloch (Kilsyth)	
	(Townhead	1826
	Crieff	1763
	Crieff (New)	1788
	Crook of Devon (Fossoway)	1800 or 2
D	Dalbeattie	1825
	Dalbeattie (Arr) (Mt. Pleasant)	1780
	Dalmarnock	1858
	Dalmore	1837
	Dalmuir (Maryhill)	1747
	Dalmuir No. 2	1825
	Dalry No. 1	1591
	Dalry No. 2	1674
	Dalsholm	1783
	* Daneside (Auchterarder)	1812
	* Devanha (Craigbeg Ferryhill)	1803
	Dumfries	1811
	Dunblane	1820
E	Duntocher	1808
	Esk (Pennycuik)	1797
F /		

3.

F	Falkirk	c	1799
	Fettykill (Levenbank) (Leslie)		1848
*	Fossoway (Crook of Devon)		1800 or 27
G	Galston (Strath) (Kilmarnock)		1770
	Galston No. 2	c	1820
	Garvald (Stirling)		1806
	Glasgow (St. Enoch's Wynd)		1851
	Glasgow (Springfield)		1847
	Gordon's Mills (Aberdeen)		1696
	Govanhaugh (Glasgow Paper Mills)	c	1860
	Grange (Midcalder)	c	1830
H	Herbertshire		1789
	Herbertshire No. 2		1806
	Hutchensentown (Govan)	c	1832
I	Inverurie		1858
J	Jellyholm (Alloa)		1832
	Jinkabout (Colinton)		1714
K	Kate's (Colinton)		1783
	Keir (Stirling)	c	1825
	Kelvindale		1845
	Kevoek		1839
	Kilsyth (Townhead)		1826 or 7
	Kinleith (Currie)	c	1792
L	Langholm	c	1812
	Lasswade (Simpson 1)		1744
	Lasswade (Simpson 2)		1746
	Leith Head		1825
*	Levenbank (Fettykill)		1848
	Linlithgow (Excise No. 2)		
	Linlithgow (Excise No. 61)	c	1830
	Loch (Linlithgow)		1820
	Loch (also Lock) (Linlithgow)		1860
	Low (Pennycuik)		1746

M /

4.

M	Melville (Lasswade)		1750
	Methven No. 1	c	1794
	Methven No. 2	c	1794
	Midcalder (New Calder)		1761
*	Milton's (Bowling)		1852
*	Milton Bog (Auchterarder)	c	1825
	Moffat		1822
	Mossy		1839
*	Mount Pleasant (Dalbeattie)		1780
	Mugiemoss (Aberdeen)		1821
N	Nethercoul (Auchterarder)	c	1832
*	New (Crieff)		1780
	New (West Calder)	c	1825
*	Newbattle (Bauldy's)		1795
*	New Calder		1761
	New Kilpatrick		1793
O	Overton (Greenock)	c	1827
P	Patrickbank (Paisley)	c	1825
	Peggy's (Cramond)		1815
	Perth No. 1)		
	Perth No. 2)		
	Perth No. 3) Woodend	c	1794
	Peterculter		1750
	Polton		1750
	Port Dundas (Milliken Park)		1850
	Portobello		1836
R	Redhall (Colinton)		1717
	Restalrig		1686
	Roths		1806
*	Rutherglen (Clyde)		1856

S /

S	St. Leonards (Lasswade)		1793
	Saltoun		1773
	Sauchie	c	1787
	Saughton		1832
	* Springfield (Glasgow)		1847
	Springfield (Polton)		1742
	Stoneywood (A6)		1770
	Stoneywood No. 2 (A6)		1786
	Stoneywood No. 3 (A6)		1796
T	* Strath (Galston)	c	1770
	Tongland		1766
	Townhead (Balerno)		1825
U	* Townhead (Kilsyth)		1826 & 7
	Upper Spylaw		1681
V	* Urr (Dalbeattie) (Mt Pleasant)		1780
	Valleyfield (Pennycuik)		1708
W	Waterton		1830
	* West (Colinton)	c	1825
	Westfield (Bathgate)		1834
	* Woodend (probably - Perth 1,2 or 3)c		1794
	Woodhall (Juniper Green)		1792
	Woodside (Glasgow) (Bruce)		1683
	Woodside or South Woodside		1837
Y	Yester		1695

Note. The dates 'c 1825' and 'c 1832' for mills arise mainly from their first mention in the reconstructed 1825 or O & B and R. W. 1832 lists.

The symbol '*' indicates a duplicate entry under an alternative name.

(Appendix) E

The Edinburgh Society. 1

The Edinburgh Society for Encouraging Arts, Sciences, Manufactures, and Agriculture was an outgrowth of the Select or St. Giles' Society of Edinburgh. The first monthly meeting was held on Monday 7th April 1755 and members were to subscribe two guineas (or more) for the purpose of the undertaking. This purpose, unlike that of the parent body, was not debating or publishing proposals for public improvements, but the offering of premiums and prizes for Scottish workmanship. In the course of the preliminary deliberations it was recorded that "the art of Printing in the country requires no encouragement ..." but it was decided that an honorary award should be made for "the best printed and most correct book ..." Touching the subject of this study, the Society remarked "The manufacture of Paper is strictly connected with printing; to the shame of this country, it is supplied with paper from countries which use not half the quantity of linen that is here consumed: in order to remedy this defect; to render people more attentive to their own interest, as well as to the interest of their country; to shew them the consequence of attention to matters which may seem trivial; it was resolved, that, for the first, second, third, fourth and fifth parcels of linen rags, gathered within a limited time, a reward be assigned in proportion to the quantity and goodness of each parcel."

Accordingly in March 1755 an advertisement appeared in the Scots Magazine announcing the formation of the Society and the offer of twenty three awards. These of course covered a considerable range of subjects

besides papermaking. One, which shows the continuing feeling, about some of the local products, was "for the best imitation of English Blankets". Four awards were made for the rag-collecting, £1:10, £1:5, £1 and 15/-. The fifth prize (of 10/-) was not given. These, and the various other awards were announced in the Scots Magazine in January 1756 and in February of that year the next list of offers was published. The number of awards had been raised to ninety-two. In addition to various premiums for rag gatherers three of the medals offered were for "the greatest quantity of best Post paper, not under six reams . . . , " and likewise for Pro Patria and for Printing paper, In January 1757 the awards were announced, as previously, and William Annandale at Auchendinny was awarded the first two medals, and Edward Collins, Glasgow (Dalmuir) the third.

The number of awards continued to rise, in 1757 it was one hundred and twenty; in 1758, one hundred and thirty-eight; in 1759 one hundred and forty two. The increases affected papermaking, in 1757 there were eleven rag premiums offered and five silver medals for paper. The two new sorts were Brown Cap and "deep blue paper for lapping fine linen." In the awards to rag-gatherers, the quantities were recorded, three of the medals went to Messrs. Hutton & Fleming (Springfield, Mill, Polton) for Post, Pro Patria and Brown Cap. Gavin Hamilton (Bogsmill, Colinton) was awarded those for Printing and the deep blue lapping papers.



MEDAL AWARDED TO MR. E. COLLINS IN 1756.

W.P.T.R.

Fig. 1.

In 1758 the medals went for Post to William Annandale; for Pro Patria, Printing and Brown Cap to Hatton and Fleming; and for deep blue lapping to Hamilton and Balfour. In this year, however, a new award "for making a pair of paper-moulds, of brass wire" was introduced and the prize of two guineas was won by Walter Moddie, near Pennycuik.

After this date, the announcements became less regular, sometimes appearing as before, and then in the Caledonian Mercury and sometimes on a noticeboard in the Royal Infirmary. The other medal awards noted however were:- for 1762, Post, Writing Post and Deep blue lapping Gavin Hamilton, Brown Cap, Fleming and Hutton. A new award in this year was a premium of five guineas to the winner of the Post medal "to be distributed by him among the most deserving of his workmen." The last "offers" found were on 18th April 1764 in the Caledonian Mercury and these did not include any medals. The Society was in a decline, due apparently to a falling off in interest and non attendance of members. This applied also to the parent Society and no more is heard of a group which had much of the spirit and intent, if not any organic connection, with the later and still continuing Royal Scottish Society of Arts.

It is regrettable, that, so far, none of the medals has been traced. Fig. 1 shows that awarded to Edward Collins in 1756 and is reproduced from a photograph taken in 1912 and published in the World's Paper Trade Review.

Enquiries from the present firm and this family have failed to bring to light either the block or the medal. An Edinburgh Teapot, made by James Welsh in 1749, and now in the National Museum of Antiquities, has engraved upon its body the details of medals awarded to John Hutton. Clearly however this could not have been made from the medals themselves. They remain elusive.

The Society's activities extended far more widely than this brief note indicates. Such particular, as well as the general encouragement no doubt helped to focus attention on the commercial, industrial and agricultural developments of the period in which the paper manufacture both benefited and played its part.

1. McElroy Literary Clubs and Societies of Eighteenth Century Scotland. Edinburgh Ph.D. thesis 1952.

E. T. SVEDENSTJERNA'S ACCOUNT OF HIS VISIT
TO A PAPER MILL IN 1803.

At Lasswade, on the road to Dalkeith, I arrived at a paper mill, which was not built for manufacturing at a large scale; everything, however, apart from the garden and the house (in which the owner himself lived) was indescribably tidy and fitted out according to the customs of the locality, etc. The Hollanders, which ground the rags, as well as the washing machine were worked by a steam engine, and the water supplied to the works from a pond, by means of iron pipes. As far as I could make out in passing by, the method was somewhat different from that applied in Swedish paper mills.

The rags were assorted and cut on knives, which had a perpendicular position end-on on tables, these being fixed to the walls all round the room. This cutting was done by old people and children. From there, the rags were brought to the washing machine: from this, the coarser rags were immediately passed, through all Hollanders, to the moulding shed, whereas the finer rags, after having passed the coarsest pair of Hollanders, were put into the bleaching swamps.

The bleaching swamps were kept in a special shed, on both sides of an oven, in and from which six crucibles or stone-ware pots (placed side by side in pairs) could be conveniently placed and lifted, respectively. These pots were covered with helmets, from which china tubes ran into the swamps. The pots were filled with sulphuric acid, sodium chloride, and manganese dioxide, in a proportion adequate for obtaining fully saturated

hydrochloric acid, which developed by means of distillation, was taken up by the water in the paper mass, and gave the latter the required whiteness after a short period.

The pulp obtained was filled into moulds in the ordinary manner, a delicate network of brass wire being suspended in the mould. After moulding, the pulp was placed between sheets of woollen felt, within which it was pressed, subsequently hung up for drying, scraped, soaked with size, dried again, and pressed anew. Scraping was done with special knives, sheet by sheet, in order to remove the small knots (which had become solid during drying), as well as the dust. This work was usually done by young girls, who showed the great skill in it, by which the English factory workers stand out from all others.

The ready made paper of all sorts had a beautiful appearance and is superior, by far, to French and Swedish paper; however, it has the shortcoming shown now by the best paper, namely, being brittle and not as durable as the old Dutch paper.

This shortcoming is probably due to nothing else, but to the custom (general in use now) of using the Hollanders with knives, which cut across the threads, - instead of the mills and pestles (used previously), the effect of which is rather one of unravelling the threads lengthwise and across: by this latter method, the paper becomes more coherent during drying and attains a much firmer texture.

This is one of the many instances to prove, that one often suffers deterioration in quality of the products, while financially profiting by

increased speed of manufacturing. In such instances the manufacturer has to check carefully, what is of advantage to him: if, in the long run, he is able to secure a better market by supplying less satisfactory goods by lower charges, why then (as I see it) should he invest money in improving the quality? Particularly so, since the consumer often cares more for bargains than for quality. Such tactics also are quite different from manufacturing and marketing low-quality goods under a reputable trade mark.

SVEDENSTJERNA, E.T. "Reise durch einen Theil von England und Schottland, in den Jahren 1802 und 1803, besonders in berg- und huttenmannischer, technologischer und mineralogischer Hinsicht".

(Translated from Swedish into German by J.G.L. Blumhof.) Marburg und Cassel 1811: J.C. Krieger. pp.141-143.

The date of the visit to Lasswade was probably about April 1803. Few dates occur in the text but he remarks on seeing snow on the hills at Keswick "in June" (p.177) From the itinerary followed between Lasswade and Keswick, the date suggested seems probable.

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